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1.0 PURPOSE OF THE INTERIM MEASURES

Background

The Ensign-Bickford Company (EBCo) is in the midst of the RCRA corrective action program. Forty-four solid waste management units (SWMUs) have been identified and investigated with extensive soil sampling and analysis. While the RCRA Facility Investigation (RFI) report is still being prepared, sufficient information has been collected to substantially understand the potential risks associated with certain site soils that contain constituents of potential concern (COPCs). Because of this understanding, EBCo proposes to conduct an interim measures program to address certain impacted soils, primarily using on-site thermal treatment. EBCo has identified an appropriate contracting team and has confirmed the availability of the appropriate equipment to perform these interim measures, beginning in late 2005.

Purpose

Based on the existing data, EBCo and The Spanish Fork Technical Committee propose the interim measures described in this work plan as a corrective action for certain COPC impacted soils. The purposes of these interim measures are summarized below:

- To provide for the immediate treatment of the higher COPC concentrations in soils, including nitrostarch mixed with soils and soils containing greater than two percent constituents of energetic materials (CEMs) as described in Section 8.4.1.2. These interim measures accelerate the management of the majority of COPCs requiring corrective action. The predominant COPCs are CEMs, including nitrostarch mixed with soil. The interim measures are proposed to begin in late 2005 and be completed in 2006. This accelerated on-site activity is consistent with EBCo's overall remedial approach for the site and is responsive to comments received from the local community.

- To approximate the final corrective action to the extent feasible. The interim measures may, in fact, achieve final corrective action at some locations. However, it is not necessary for the interim measures to achieve final corrective action in any of the SWMUs to achieve the primary objectives. To the extent that it is feasible, it is an objective of this interim measures process to facilitate agreement with the State of Utah Department of Environmental Quality, Division of Solid and Hazardous Waste (DSHW) on the underlying basis for determining which soils require corrective action. Using that basis, it should be possible to identify those areas (i.e. SWMUs) where both EBCo and DSHW agree that the interim measures: 1) have also achieved final corrective action; 2) do not achieve final corrective action; or, 3) have an undetermined status with respect to final corrective action. These three possible outcomes will be incorporated into the management of the SWMUs following the interim measures. In any event, the goal of interim measures will be to address the majority of COPC-impacted soils and to add clarity to our understanding of the SWMUs and activities remaining, if any, to achieve final corrective action.

- To perform corrective action to industrial/commercial criteria (e.g., direct exposure) and/or residential criteria (e.g., migration to regional aquifer), as appropriate for the exposure scenario.

2.0 BENEFITS OF THE INTERIM MEASURES

Several general and specific benefits result from the proposed interim measures as described below.

2.1 General Benefits

- Treatment of COPC-impacted soils is accomplished much earlier than would be the case under the traditional RFI/CMS process. Active field activities are scheduled to commence this summer and to be completed within approximately six months.

- Management of nitrostarch mixed with soils and soils containing greater than two percent CEMs.

- Reduction of potential human health and/or environmental risks earlier in the corrective action process.

- Use of a preferred technology (thermal destruction) for CEMs as the primary COPCs.

- Minimization of COPCs by destroying the CEMs on-site, rather than relocating them. The thermally treated soils will be of appropriate quality for reuse on the site. A relatively small quantity of soils that contain lead will be removed from the site for landfill disposal.

- Management of the majority of soils on-site, thereby minimizing potential truck traffic to and from the site.

2.2 RFI and CMS Benefits

- Following thermal treatment of soil, samples will be collected from soils remaining in the SWMUs. Data from these samples will be used in conjunction with existing RFI data for the remaining soils. As a result, there will be a high degree of confidence in the data used in the RFI risk assessment.

- The assessment of data in the RFI will be limited to the remaining soils (treated soils remaining on site and soils not excavated), greatly simplifying its presentation. The risk assessment will be focused on whether or not additional management of these lower concentration soils is necessary. Interim measures will seek to achieve residual risk levels that will be consistent with final corrective action.

- The CMS following interim measures will be greatly simplified as will potential future management of the low-concentration residually impacted soils. To the extent that any remaining soils require corrective action, the final corrective action should be efficient and straightforward.

- During the interim measures process, ongoing dialogue on the exposure assumptions, hydrogeologic parameters, conceptual models, etc. that affect the risk assessment will serve to resolve many of these issues for purposes of not only the interim measures, but also the final corrective action. This communication will further the level of understanding and agreement between EBCo and DSHW on issues that are essential to the RFI risk assessment.

- For both the RFI and CMS, an accelerated completion and DSHW review is anticipated based on the reasons stated above. This could result in reaching final corrective action on an even more efficient timeline.

3.0 APPLICATION OF PROPOSED INTERIM MEASURES METHODS

The proposed interim measures address two categories of soils on the site: soils that contain primarily CEMS; and, soils that contain primarily lead. A majority of the soils contain CEMs and will be managed using thermal treatment. A minority portion of the soils on-site contain lead and will be transported off-site for appropriate landfill disposal. A fraction of the lead soils also containing CEMs will be thermally treated before being shipped off-site for landfill disposal. A detailed technical description of the interim measures is presented in Section 8.0 of this work plan. Presented below is a summary description of the application of the interim measures to the appropriate soils.

3.1 Thermal Treatment of CEMs and Other Organic Constituents

Thermal treatment has been selected as the primary interim measure for site soils that contain CEMs and other organic constituents. The following discussion points support this proposed approach:

- On-site thermal treatment minimizes the number of times that the soils must be handled, thereby minimizing potential risk.

- Thermal treatment is a proven technology used at other sites with soils that contain CEMs or other organic constituents. Most notably and recently, the thermal treatment equipment proposed for use at the Spanish Fork site has successfully treated soils that contain similar CEM constituents at the Massachusetts Military Reservation (MMR) on Cape Cod, Massachusetts. Similar mobile thermal treatment equipment was also recently used to successfully treat soils containing HMX, RDX and TNT at the Kansas Army Ammunition Plant. Therefore, there is a track record of successful application of the proposed thermal treatment technology on soils for the particular COPCs of interest at the Spanish Fork site.

- EBCo has verified that the appropriate equipment and a qualified contractor are available to perform the interim measures in the timeframe proposed. The contractor has applied for the required air permit (permit application known as a Notice of Intent resulting in a permit known as an Approval Order) to operate this equipment at the Spanish Fork site and that Approval Order was issued on July 19, 2005. Therefore, the opportunity to implement the proposed interim measures has been verified and secured.

- CEMs are the primary group of COPCs that require corrective action at the site. Thermal treatment is particularly well suited for management of CEMs and other organics.

- Thermal treatment takes advantage of the inherent physical/chemical properties of CEMs and irreversibly mineralizes them to simple and common atmospheric molecules (such as carbon dioxide, water and NOx) that pose no significant risk to human health or the environment. From a safety perspective, EBCo prefers thermal treatment of any materials, including soils, that may contain CEMs. As an industry practice and standard, thermal treatment is the presumptive means of managing the potential reactivity risks associated with CEMs. Therefore, thermal treatment of soils that contain CEMs is entirely consistent with the preferred practices of not only EBCo, but the energetic materials industry.

- Other organic constituents (volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs) and petroleum hydrocarbons including diesel range organics (DRO) and motor oils (MO)) are present in a minor quantity of soils and/or at minimal concentrations that are also amenable to thermal treatment. Rarely do these constituents independently drive the need for corrective action of soils at the EBCo site. Nevertheless, these other organic constituents will be appropriately managed using thermal treatment.

3.2 Off-site Disposal of Soils Containing Lead

A small portion of soils that require corrective action at the Spanish Fork site contain the metal lead. Since metals are not removed by thermal treatment, landfill disposal of soils containing lead is the proposed interim measure. Landfill disposal of soils that contain metals is commonly the presumptive remedy, especially for relatively small quantities.

A fraction of the soils that contain lead also contain elevated concentrations of CEMs. For these soils, thermal treatment will be performed prior to landfill disposal to remove CEMs. Segregation of this category of soils will be necessary in order to properly manage them. Details of these methods and procedures are provided in Section 8.0 of this work plan.

3.3 Possible Off-site Disposal of Soils Containing PAHs

A relatively small quantity of soils on the site, in SWMUs 17 and 24, contain PAHs, typically associated with petroleum hydrocarbons, at concentrations that may be subject to interim measures. These soils may be suitable for direct off-site disposal without thermal treatment. In this case, the interim measure would be limited to excavation and off-site disposal. However, the decision may be made to process at least a portion of the soils containing these constituents in the TTU. In order to accommodate both possible soil management options, soils from SWMUs 17 and 24 that contain PAHs at concentrations that are subject to interim measures, will be segregated and managed separately from other soils.

In the case of on-site thermal treatment of soils containing PAHs, the segregated soils will be treated at a temperature appropriate for this class of constituents (between 800 and 900 degrees F) and the treated soils tested for PAHs. Final corrective action management decisions for these soils will be based on the treated soil data. Details of these methods and procedures are provided in Section 8.0 of this work plan.

4.0 PUBLIC INVOLVEMENT

The Utah Department of Environmental Quality (DEQ) has suggested that there be an opportunity for public involvement with respect to the proposed interim measures. We anticipate the opportunity for public involvement as follows:

- In anticipation of the formal public notice, two informational meetings were held to provide the public with the opportunity to learn more about the planned interim measures. The first meeting was held in Mapleton City on June 29th and the second was held in Spanish Fork City on June 30th. Both meetings were held from 6:00 to 8:00 pm in an open house format. No particular concerns were expressed by the public with regard to the planned activities.

- The Interim Measures Work Plan is an application for authorization from the Executive Secretary to operate a Corrective Action Management Unit for thermal treatment. Once DSHW considers the work plan to be in an approvable form, a 30-day public comment period will be initiated. It is anticipated that during the comment period, DEQ will schedule hearings in Spanish Fork and Mapleton to receive public comments.

- In support of the thermal treatment activities, the thermal treatment contractor has obtained a permit (Approval Order) from the Utah, Department of Environmental Quality, Division of Air Quality (DAQ) to construct and operate the thermal treatment equipment. A public notice of this activity was posted as required. The 30-day public comment period has expired and there was no request for a public hearing, nor were any comments received.

The Interim Measures Work Plan and other documents (e.g. the corrective action order that authorizes the interim measures, air permit, etc.) may also be submitted to the Mapleton City and Spanish Fork City document repositories as they become available.

Based on the nature and location of the operations on the Spanish Fork site, the proposed interim measures will not typically be visible or audible to the public. The most potentially visible part of the interim measures will be the transportation of minor quantities of lead-impacted soils to a landfill. The public may notice increased truck traffic, for a limited duration, coming and going from the site related to these specific activities. Truck traffic will briefly increase during mobilization and demobilization of the equipment needed to implement the interim measures. During cold and humid conditions, water vapor may be visible from the thermal treatment air emissions stack.

5.0 PERMITS AND APPROVALS

Certain permits, plans and approvals will be necessary to implement the proposed interim measures. The following sections present brief descriptions of the permits and approvals that will be obtained in support of the proposed interim measures. Because each of these permitting processes stands on its own, the descriptions provided below are brief and intended to indicate the overall administrative process necessary to implement the proposed interim measures. However, all of these permits, plans or approvals need to be in place to implement the interim measures.

5.1 Interim Measures Work Plan Approval

Approval of this interim measures work plan by the Executive Secretary of the DSHW is required to implement the proposed interim measures. As with previous field work at the site, EBCo and its representatives or contractors will seek to work cooperatively with DSHW staff throughout the project to address any issues that may arise.

5.2 State Approval of Treatment CAMU

Thermal treatment operations at the Spanish Fork site will be performed in a Treatment CAMU as authorized by DSHW in a corrective action order (either as a modification of an existing order or a new order). The Treatment CAMU will receive only non-hazardous remediation wastes and no hazardous wastes will be processed through the Thermal Treatment Unit (TTU).

5.3 Air Permitting

Air emissions from the thermal treatment equipment require a permit (Approval Order) from the DAQ under the new-source review program. The thermal treatment contractor has submitted an air permit application, an “Intent to Approve: Low Temperature Thermal Desorption Unit, Utah County” was subjected to public notice, no public comments were received and DAQ issued the

Approval Order for the thermal treatment unit on July 19, 2005. As part of the air permit, the thermal treatment contractor has also submitted a Fugitive Dust Control Plan for operations within the Treatment CAMU. The air permit will authorize construction and operation of the thermal treatment equipment, in support of the DSHW order authorizing thermal treatment operations in the Treatment CAMU.

In addition to the air emissions permit, the general remediation contractor will prepare and submit a Fugitive Dust Control Plan to the DAQ, in conformance with The Fugitive Emissions and Fugitive Dust Rule (R307-309).

5.4 "EPA's Area of Contamination" Policy

Soils with greater than two percent CEMs will be mixed with underlying soils (which also require corrective action) in the SWMU where they are found, prior to movement to the treatment or storage CAMU, to produce a soil that contains less than two percent CEMs. This activity is allowable under EPA's Area of Contamination (AOC) Policy (EPA guidance, March 13, 1996 EPA memo, "Use of Area of Contamination Concept During RCRA Cleanups") and does not require a separate approval. Blending these soils will ensure that soils introduced into the thermal treatment unit do not exhibit the reactivity characteristic and will provide a more consistent CEM content in the feed soils entering the thermal treatment unit. Similarly, the AOC Policy will be applied to soils subject to thermal treatment that may be found to contain lead at concentrations exceeding the Regulatory Limit (RL) of 5 mg/L based on the Toxicity Characteristic Leaching Procedure (TCLP). These soils will be stabilized in-place prior to moving them to the Treatment or Storage CAMUs. This in-place stabilization will reduce TCLP lead concentrations below the 5 mg/L RL at which time these soils can be processed through the TTU, or directly shipped off-site for disposal, as appropriate, based on CEM content.

5.5 Existing Storage CAMU

Approval for a Soil Storage CAMU has already been obtained under a state corrective action order (Corrective Action Order No. 0306016, Corrective Action Management Unit for the

Temporary Storage of Remediation Waste, The Ensign-Bickford Company, Spanish Fork, Utah). This existing approval is sufficient to support the interim measures soil management program on the site. About 5,000 tons of soils from the interim measures activities at SWMU 27 and the burn area closures have already been moved to the storage CAMU. The corrective action order limited the operation of the storage CAMU to a two-year period, with an opportunity to extend that period as needed. The two-year period expires around the end of 2005. As detailed in Section 11.0 of this work plan, the proposed interim measures activities should be completed in the first half of 2006. In accordance with the corrective action order for the storage CAMU, EBCo will request an extension for the period for operation of the storage CAMU to accommodate the completion of interim measures and CAMU closure.

5.6 Storm Water Management Permitting

In support of both the thermal treatment activities and the general excavation and soils management activities on the Spanish Fork site, the contractor will prepare a storm water management general permit. Storm water best management practices will be maintained throughout the project.

6.0 DATA IN SUPPORT OF THE INTERIM MEASURES

6.1 RFI Data and Risk Assessment Factors

Extensive soil analytical data have been collected during the RFI. That data set forms the primary basis for deciding which soils will be subject to corrective action under the interim measures. These data essentially define the soil quality (COPC concentrations) both laterally and with depth in each SWMU. It is these data that, for purposes of the interim measures, will be compared to risk-based criteria in order to reduce the residual risk in soils to industrial (e.g., direct exposure) or residential (e.g., migration to regional aquifer) criteria, as appropriate. These criteria are more fully described in the *Proposed Human Health Risk Assessment Methods RCRA Closure of Open Burning Open Detonation Units* (Charter Oak, December 2004) document submitted to DSHW for purposes of the burn area closures, and revisions thereto made by correspondence in response to DSHW comments.

In general, the following soils will be included in the thermal treatment interim measures:

- Soils exceeding the human health risk assessment (HHRA) criteria for direct human exposure under an industrial/commercial standard.
- Soils containing two percent (2%) or more CEMs by weight. As they are currently found in-place, these soils are considered potentially reactive and will be subject to thermal treatment after blending with other soils to a calculated CEM content of less than two percent (2%). After blending and prior to excavation, these soils will no longer have the potential to exhibit the reactivity characteristic.
- With respect to potential impacts on the underlying ground water, soils exceeding the Migration to Regional Aquifer (MTRA) criteria may be included, at the discretion of EBCo. To the extent that EBCo and DSHW are in agreement on the underlying MTRA basis, those criteria will be used to guide the interim measure. However, it is possible that evaluation/approval of one or more of these criteria will not be completed in time to fully incorporate them into the interim measures.

Ecological exposure criteria are not being used to determine whether soils require corrective action under the interim measure. Based on the Spatial Ecological Risk Assessment methods and assumptions, EBCo does not believe that ecological exposure will independently drive corrective action soil volumes. The ecological assessment will be based on the post-interim measures data in the RFI.

Any determinations that the interim measures have satisfied the final corrective action requirements will be documented in the RFI report for DSHW review.

6.2 Factors Used for Interim Measures and/or Final Corrective Action

Various exposure assumptions, hydrogeologic parameters, conceptual or mathematical models and other factors (collectively the "IM factors") are employed in order to evaluate the risk represented by site soils. Where possible, EBCo desires to identify IM factors that may be approved for purposes of both the interim measure and the final corrective action. However, there may be criteria that are approved only for purposes of the interim measure; final judgment on these criteria will be made as part of the final corrective action decisions. Whether in the context of this work plan or through separate approvals, EBCo will seek to clarify whether or not there is agreement with DSHW as to which of the IM factors also satisfy the final corrective action criteria.

6.3 Treated Soils Criteria

Soils that meet the treated soils criteria will remain on-site. Therefore, it is necessary that these criteria will not be revisited for final corrective action. However, the RFI risk assessment will take into account the actual, measured COPC content of the treated soils to satisfy the requirements for final corrective action. Table 6-1 presents the proposed constituent concentration goals for treated soils. Forward risk assessment results for these interim measures treatment goals are presented in Appendix A.

These treated soil criteria will be applied by collecting and analyzing samples of each eight-hour batch of treated soil, as described in Section 10.0 of this work plan. Accordingly, each eight-hour batch of soil will be confirmed as having met the required criteria and approved for consolidation with other treated soils that have been so confirmed.

In addition to the process described above, EBCo may statistically evaluate constituent concentrations based on all of the post-treatment data, at the end of the project. While this calculation should have no effect on the confirmation of treatment, it may be useful for other purposes, such as evaluating the risk contribution of the treated soils in the RFI, or evaluating whether treated soils can be placed in locations other than those assumed when the treatment goals were established. In any event, the data collected will be useful for evaluating all possible risk scenarios, including residential, in the final RFI risk assessment. Risk-based objectives for corrective action must be met regardless of the treatment goals established for the purposes of interim measures.

The treated soils criteria (Table 6-1) are not the post-excavation criteria for any of the SWMUs.

Table 6-1: Interim Measures Soil Treatment Goals

Constituent	Treatment Goal (mg/kg)	Constituent	Treatment Goal (mg/kg)
Cyclotrimethylenetrinitramine (RDX)	1	1,2,4-Trimethylbenzene	19
Cyclotetramethylenetetranitramine (HMX)	429	1,3,5-Trimethylbenzene	8
Pentaerythritol tetranitrate (PETN)	250	Acetone	148
2,4,6-Trinitrotoluene (TNT)	1	Bromochloromethane	1.5
Ethylene glycol dinitrate (EGDN)	10	Isopropylbenzene (Cumene)	24
Diethylene glycol dinitrate (DEGDN)	10	m,p-Xylene	3
Triethylene glycol dinitrate (TEGDN)	10	Methylene chloride	1.9
1,2,4-Butanetrioltrinitrate (BTTN)	10	Naphthalene	1
Metriol trinitrate (TMETN)	10	n-Propylbenzene	459
Nitroglycerine (NG)	1	p-Cymene (P-Isopropyltoluene)	24
2,4-Dinitrotoluene	0.08	sec-Butylbenzene	46
2,6-Dinitrotoluene	0.03	Trichloroethene (TCE)	0.002
Oil and Grease (motor oil)[1]	300	Diesel Range Organics[1]	100

(1) Total Petroleum Hydrocarbons (TPH) by method 8015. Utah LUST program cleanup levels.

7.0 SOIL VOLUMES SUBJECT TO INTERIM MEASURES

The following sections describe the soils that will be managed during the interim measures. Information is provided on the criteria used to identify soil volumes that will be addressed and the constituents present in these soils.

7.1 Determination of Minimum Soil Volumes Subject to Interim Measures

The presence of soils containing CEMs at two percent or more was the first criteria applied to establish soil volumes for interim measures. Soils known or suspected to have greater than 2% total CEMs are considered to be potentially reactive, as they exist in-place. The distribution of these potentially reactive soils was determined based on the evaluation of total CEM content from the RFI soils data. These potentially reactive soils are typically limited to the upper six to twelve inches of the soil column with a majority of these soils found in the area of SWMUs 1, 30 and 42. Approximately 3,000 to 6,000 tons of soil has been identified in this category.

Nitrostarch product has been identified in SWMU 26 and is a CEM requiring corrective action. The quantity and distribution of nitrostarch was described in the *SWMU 26 Nitrostarch Delineation Report* (Charter Oak, 2002). Approximately 135 cubic yards of nitrostarch mixed with soil is present in this area, of which approximately 55 cubic yards is nitrostarch product (exceeding the two percent CEM content threshold). It is anticipated that the nitrostarch will be treated during the interim measures. A nitrostarch management approach is currently under development. Additional details regarding nitrostarch management are presented in Section 8.4.1.4.

A human health risk assessment was performed on the RFI soils data in accordance with the methods presented in the document entitled *Proposed Human Health Risk Assessment Methods RCRA Closure of Open Burning Open Detonation Units* (Charter Oak, 2004) and revised pursuant to DSHW comments. Soils having constituent concentrations in excess of risk-based target criteria for the on-site industrial worker, on-site construction worker and/or the off-site resident were identified and are subject to the interim measure. Risk-based criteria for the hypothetical future on-site resident have not been used to establish interim measure soil volumes.

Figure 7-1 illustrates the approximate location and distribution of soils currently anticipated to be subject to the interim measures program. The colors used to delineate the excavation areas in Figure 7-1 indicate approximate depths of excavation. The table included in Figure 7-1 provides the approximate quantity of soils from each SWMU that will be subject to the interim measures (thermal treatment or landfill disposal) and also provides an approximate breakdown of soil quantities by criteria (i.e., potentially reactive, industrial worker, off-site resident, etc.). Actual excavation locations, areas and depths may differ from what is presented in Figure 7-1. Table 7-1 presents the estimated weighted average concentrations of COPCs for the soil volume represented in Figure 7-1.

7.2 Potential for Additional Soil Volumes

The quantity of soil presented in Figure 7-1 represents the minimum quantity that will be managed during the interim measure. EBCo may elect to treat additional soil volumes based on continuing evaluation of risk-based cleanup criteria as determined by the human health risk assessment. Post-excavation analytical data for soil samples collected upon removal of planned soil volumes may also indicate the need for additional soil excavation and treatment.

8.0 INTERIM MEASURES ACTIVITIES

8.1 General Description of Interim Measure Activities

The interim measures will primarily consist of on-site excavation and thermal treatment of soils that contain elevated concentrations of CEMs and lesser concentrations of other organic constituents. These soils will be treated on-site using a mobile, direct-fired thermal treatment unit (TTU). Soil treatment will occur in a treatment CAMU authorized via a corrective action order issued by DSHW. Untreated soil stockpiles will be managed at the point of excavation, in the previously approved temporary soil storage CAMU or in the treatment CAMU. Treated soils will be chemically characterized during the interim measures process to demonstrate that they have met the treatment objectives and may be managed in either of two fundamental ways. Some soils may be used to backfill completed excavations either in part or in whole. Other soils will be stockpiled on-site, amended to support plant growth and seeded until final corrective action decisions are made.

Soils that contain concentrations of lead in excess of risk-based criteria will also be managed during the interim measures. The majority of the soils containing elevated lead concentrations will be transported to an appropriate off-site disposal facility without prior thermal treatment. A small portion of soils that contain lead concentrations in excess of risk-based criteria may require thermal treatment prior to off-site disposal to remove the CEM content.

Two SWMUs (17 and 24) contain relatively small quantities of soil containing PAHs, typically associated with petroleum hydrocarbons, at concentrations that may be subject to interim measures. These soils will be segregated at the point of excavation for management in one of two possible ways. Some or all of these soils may be suitable for direct off-site disposal at an appropriate facility without prior thermal treatment. Some of these soils may be thermally treated on-site. For the soils shipped off-site for disposal, characterization sampling and analysis of the segregated materials will be performed in accordance with the requirements of the receiving facility. For soils that are thermally treated on-site, post-treatment PAH sampling and analysis will be performed in accordance with the protocols established in this work plan. Appropriate risk management decisions for the treated PAH soils will be based on the post-treatment data. For all other areas of the site, the PAH data collected during the RFI is considered sufficient for site characterization and risk management decisions. For these other areas, no post-treatment PAH soils data will be collected.

Details regarding the project team and planned interim measure activities, including excavation, soil preparation, thermal treatment, chemical characterization and stockpile management are presented in the following sections.

Figure 8-1 shows the locations of the treatment CAMU, storage CAMU, AOCs where in-situ treatment (soil blending and/or stabilization) may occur and the treated soil stockpile area.

8.2 Description of the Thermal Treatment Unit

8.2.1 Thermal Treatment Process, Equipment and Operating Conditions

The thermal treatment process generally consists of soil preparation, primary solids treatment and secondary air/particulate treatment. Refer to Figure 8-2 for a schematic depiction of the thermal treatment process. The end result of thermal treatment is the permanent destruction of CEMs and other organic constituents in soil to concentrations that meet the treatment criteria, and a permitted air discharge that has been treated to remove residual gas-phase constituents and particulate matter. Other organic constituents that are present in minor quantities in site soils, such as VOCs, SVOCs, PAHs and petroleum hydrocarbons (including DRO), are also amenable to thermal treatment and will be processed by the TTU.

The following sections describe the individual thermal treatment steps, operating conditions and operational requirements in more detail.

8.2.1.1 Soil Preparation and Feed

Soils will be delivered to the Treatment CAMU in dump trucks. The quantity of soil delivered will be measured using a certified truck scale prior to soil preparation and treatment. Soil will be fed to the TTU through a multi-step preparation and feed area consisting of a conveyor, vibratory screen and mass flow feeder. Soil is loaded onto the conveyor by a front-end loader. The conveyor feeds soil to a bar-type grizzly and a single-deck vibratory screener which culls and segregates oversized rocks and reduces the feed material to 2.5 inches in diameter or less. Rocks and other materials removed by the screen (>2.5 inches) will be temporarily stockpiled in the Treatment CAMU and processed through the vibratory screen a second time. The re-screened material will be visually inspected to determine if soils or soil clumps are adhering to the screened materials. If visual inspection indicates that soils are adhering to the screened materials, they will be processed through the vibratory screener until the materials pass visual inspection. Screened-out materials passing visual inspections will then be stockpiled in a staging area and ultimately reused on-site in accordance with section 8.4.3. The calculated quantity of gravel (>2.5 inches) in site soils subject to corrective action, based on boring and excavation logs, is less than one percent of the total by volume. Residual soils resulting from the re-screening process, if any, will be collected and processed through the TTU.

Consideration has been given to the possibility that a “chunk” of CEM-containing material may be identified during the inspection of screened-out debris. Any such chunks will be identified, removed by the screened-out debris stockpile inspector and managed appropriately.

Screened soil will be stockpiled in a staging area within the treatment CAMU and subsequently fed to a mass flow feeder using a front-end loader. The mass flow feeder consists of a variable speed belt conveyor to control the feed rate and a belt scale system that indicates to the operator how much screened soil (+/-5% accuracy) is being fed to the TTU (in tons per hour). The scale will be calibrated prior to start-up and zeroed at least once per operational week. The belt scale conveyor system subsequently delivers the prepared soil to the rotary dryer portion of the thermal treatment unit.

The treatment rate is influenced by soil characteristics such as moisture and clay content. Specifically, the higher the moisture and clay content the slower the soil is processed. Therefore, to the extent feasible, impacted soil staging stockpiles within the soil preparation area will be covered during rain events so the material does not increase in moisture content and/or create a runoff management issue. If necessary, moist and/or clayey (cohesive) soils will be amended with lime in the soil preparation area to reduce the moisture content and generate a more friable material prior to thermal processing. Palletized quick lime will be utilized, rather than a pulverized lime, to avoid the generation of excess lime dust during the mixing process. Dust control will be maintained, in accordance with the dust control plan, during the various soil management activities.

8.2.1.2 Soil Phase Treatment

Prepared soil enters the TTU via the primary solids treatment unit (Astec/SPI 7' x 30' co-current direct fired rotary dryer) where it is heated to the appropriate temperature to meet the treatment criteria. The angle of the thermal desorber controls the rate at which soils are processed. Based on available information, the estimated treatment temperature necessary to achieve the treatment criteria for CEMs is approximately 600^o Fahrenheit; however, the actual treatment temperature will be determined during system startup as described in Section 8.2.2. The draft approval order from the Department of Air Quality (DAQ) specifies a soil treatment temperature of 700^o Fahrenheit, but allows for the actual operating temperature to be modified based on the results of the treatment campaigns. Therefore, both DAQ and DSHW will receive the same recommendation for a full-scale soil treatment temperature based on the results of the soil treatment campaigns. Once soils have proceeded through the rotary dryer, CEMs are expected to have decomposed or mineralized.

In order to achieve the target temperatures for soil exiting the dryer, all moisture in the soil feed is driven off (it is physically necessary to remove the water in order to heat the soils to temperatures above the boiling point of water – approximately 212^o Fahrenheit). Once devoid of moisture, the soil looses its capacity to remain cohesive. Once the moisture has been removed, the rotating agitation of the dryer has the effect of reducing any clumps of dried soil to a granular state. This result is experienced and observed by the thermal treatment contractor at both their fixed and mobile facilities, since they operate in the same manner. Therefore, no soil clumps exit the dryer, regardless of the soil type (clay, silt, sand or gravel).

Other organics are either mineralized at this stage or are desorbed into the air stream and destroyed in the oxidizer (see section 8.2.1.3). Treated solids (soil) are directed to a clean soils conditioning unit consisting of a 16' x 4' single shaft pugmill mixer for cooling and re-hydration. The soil is re-hydrated to a moisture content of approximately 11.5% at the pugmill mixer, resulting in a final moisture content of approximately 8.5% in the treated soil after evaporation. Dusts and particulates resulting from solids treatment in the rotary dryer are collected in an Astec/SPI dual cyclone dust collection system and directed back to the pugmill mixer for final processing. Solids collected in the baghouse on the air stream are also directed to the pugmill mixer for blending with the other treated solids. Soil exiting the pugmill mixer is considered to be treated, pending treatment confirmation results. The estimated temperature of the treated soil as it leaves the end of the conveyor, or as it lands in the stockpile, is 150 – 200 degrees Fahrenheit. Air exiting the pugmill mixer is diverted to the final particulate filtration phase of process air treatment, which is described in the following section.

The treated soil is moved by loader, and trucks as necessary, to the treated soil stockpile area. The loader and trucks managing the treated soil are not the same equipment that handle the untreated soil. Segregation of the equipment between treated and untreated soils is maintained.

8.2.1.3 Air Phase Treatment

The heated air generated by the rotary dryer enters the Astec/SPI high temperature thermal oxidation unit, where additional heat is applied at a temperature of approximately 1,500^{o} Fahrenheit, destroying residual gas phase constituents including VOCs, SVOCs and PAHs. At this temperature the expectation is for complete thermal decomposition of the CEM compounds. For the segregated soils from SWMUs 17 and 24 containing PAHs, the oxidation unit temperature will be adjusted to 1,710^{o} Fahrenheit as a conservative precaution. CEM compounds not completely thermally decomposed in the dryer, if any, will be completely thermally decomposed in the oxidation unit. Actual thermal oxidation temperatures will be determined during system start-up and recommended to DSHW and DAQ for approval in the Test Burn Report. Treated air leaving the thermal oxidation unit is directed to an evaporative cooling chamber where it is cooled and re-hydrated prior to entering the final particulate filtration step.

The final particulate filtration phase, consisting of an Astec 50,000 cfm baghouse, removes residual particulates from air generated in the cooling chamber and pugmill mixer. Particulates are removed periodically from the baghouse filter by a compressed air pulse and are returned to the pugmill mixer for blending with the other treated material. Air exiting the baghouse is induced through the process exhaust stack. Continuous emissions monitoring for carbon monoxide and oxygen will be performed in the exhaust stack to verify efficient combustion.

Process air is drawn through the various air phase treatment steps by an induced draft fan located at the end of the treatment line (refer to schematic Figure 8-2). This fan runs continually during processing in order to control the process temperatures, prevent overheating and control dust and vapor emissions. The induction fans draws air at a rate of approximately 40,000 actual cubic feet per minute (acfm) and a negative pressure of approximately 0.5-inches water column (w.c.) is maintained at the face of the dryer.

The air treatment process is protective of human health and the environment because it removes the treated particulates from the air stream and subjects any volatilized COPCs in the air stream to temperatures of at least 1,500 degrees Fahrenheit. Only when the segregated soils containing PAHs are treated, the oxidizer temperature will be adjusted to at least 1,710 degrees Fahrenheit. Operation of the equipment will be subject to the conditions of the approval order drafted by the DAQ.

Work recently performed at the Kansas Army Ammunition Plant (KAAP) demonstrates the effectiveness of the planned treatment for a similar list of key constituents. Refer to the information presented in the paper presented by representatives of Environmental Chemical Corporation entitled, "Low Temperature Thermal Treatment of Explosive Contaminated Soils at the Kansas Army Ammunition Plan, Parsons, Kansas" (Appendix B). Table II of that paper reports Project Air Emissions Regulatory Criteria. Primary constituents in soils at this site were RDX, HMX and TNT. Table II reports that >99.99% removal efficiency for RDX and TNT were verified using feed soil analysis and in-stack measurements. For the Kansas project, the dryer is reported to have operated within a range of 575 – 650 degrees Fahrenheit and the oxidizer at a minimum of 1,823 degrees Fahrenheit. While the oxidizer temperature for the KAAP project was somewhat higher than planned for the Spanish Fork site, the two projects have substantial similarities.

In addition to the continuous emission monitoring for carbon monoxide and oxygen throughout the project, stack testing will be performed to demonstrate the effectiveness of the treatment process. This stack testing will be performed during the initial full-scale operational period as described in section 10.1.2 of this work plan. After establishing the optimal operating parameters, including dryer and oxidizer exit temperatures, a stack test will be performed over about a two day period. During this time, the soil throughput will be at 100% capacity and the soil treated will include remaining untreated test burn soils containing above-average concentrations of site-related constituents that were excavated and prepared for the test burn period. Because it is expected that the remaining test burn soils will not be of sufficient quantity for the entire stack test period, additional soils containing above-average concentrations of CEM compounds will also be processed during the stack test. Using standard EPA-approved methods, three one-hour replicate air samples will be collected over the period of the stack test for each of the parameters identified below:

- Particulates;
- Gases (O_2, CO, SO_2, & NO_x);
- Semi-volatile organics;
- Volatile organics;
- Metals (RCRA 8 and antimony); and,
- Constituents of Energetic Materials.

The proposed stack test monitoring parameters are consistent with stack tests completed at other sites where CEMs were treated (i.e. MMR and Kansas AAP). The results of the stack tests will be included in a report submitted to DSHW and DAQ as described in section 12.2.

8.2.1.4 Automatic Soil Feed Shut-Off (AWFSO) Conditions

In the event that critical operating conditions in the thermal treatment unit vary outside of the specified range, there are provisions for the soil feed to automatically shut down. This feature of the thermal treatment operation safeguards the potential for inadequate treatment of either the soil or air streams. In each of the following circumstances, the soil feed automatically shuts down through the electronic controls systems until the out-of-specification condition is corrected, allowing for the soil feed to be manually restarted.

Soil feed tonnage exceeds the project-specific maximum rate (10 minute rolling average basis)

The weight of soils is measured with a belt mounted scale. The feed rate is continuously monitored, totalized and recorded. The monitors include a Honeywell controller readout, a belt scale indicator and the ancillary computer. The control box and ancillary computer continuously total the amount of soil treated. The AWFSO is controlled through the programmable logic controller (PLC). As a practical matter, a maximum soil feed tonnage set-point is secondary to (or a function of) the dryer soil exit temperature. The TTU is typically operated at the highest throughput at which the soil exit temperature is reliably attained. As long as the dryer soil exit temperature is achieved, the soil feed rate is not a critical parameter. Nevertheless, the maximum soil feed rate set-point is established in the treatment campaigns and serves as a conservative restriction on overall operations. The maximum feed rate during full-scale operation will be established by approval from DSHW, based on the recommendations made in the test burn and stack test reports.

Loss of negative pressure inside the dryer (point measurement once per minute)

Negative pressure is measured with a photohelic gauge in the control room. Tubing from the burner face is connected to the photohelic gauge and the AWFSO is controlled by the PLC. The

AWFSO is triggered if a zero pressure is observed. As a practical matter, under a zero pressure condition, dust or vapor would also be observed by the TTU operator at the feed end of the dryer.

Temperature of soil exiting the dryer falls below the specified project-specific minimum operating temperature (10 minute rolling average basis)

A thermocouple is situated in the exit breach of the dryer. Treated soil passes over and is in direct contact with the thermocouple. The temperature is continuously monitored on the Honeywell controller and recorded on a paper circle chart and the ancillary computer. The AWFSO is controlled through the PLC. For purposes of logging data and calculating the 10-minute rolling average, measurements are recorded once per minute. The minimum temperature set-point will be established from the treatment campaigns and recommended for approval by both DSHW and DAQ.

Temperature of air exiting the oxidizer falls below the specified minimum operating temperature (10 minute rolling average basis)

A thermocouple is situated in the exit of the oxidizer. The temperature is continuously monitored on the Honeywell controller and recorded on a paper circle chart and the ancillary computer. The AWFSO is controlled through the PLC. For purposes of logging data and calculating the 10-minute rolling average, measurements are recorded once per minute. The minimum temperature set-point will be established from the treatment campaigns and recommended for approval by both DSHW and DAQ.

Pressure drop over the baghouse falls below the set-point (point measurement once per minute)

The differential pressure is measured with a magnahelic gauge in the control panel. A loss of differential pressure is continuously monitored based on measurements recorded once per minute. The AWFSO is controlled through the PLC. As established in the DAQ Approval Order, the acceptable operating range of differential pressure across the baghouse will be a negative pressure between 1” and 10” of water column. Operation outside of this range will trigger and AWFSO.

<u>Carbon monoxide levels in the air discharge exceed 100 ppm on a one-hour rolling average</u>

Continuous emissions monitoring will be performed for carbon monoxide as a measure of efficient combustion. Carbon monoxide levels exceeding 100 ppm on a one-hour rolling average basis will trigger AWFSO through the PLC. The individual measurements of carbon monoxide will be logged on a one-minute basis, similar to the other parameters.

<u>Water supply is interrupted (causes excess temperature in air stream to baghouse – point measurement once per minute)</u>

Low water pressure is measured at the supply line and indicated with an alarm in the control room. High temperature due to a lack of cooling ability will trigger AWFSO through the PLC. Each of these conditions is triggered based on measurements made on a frequency of once per minute.

<u>Gas supply is interrupted (instantaneous response – shuts down TTU)</u>

If the gas supply is interrupted, the burners will shut off and shut down the soil feed. The AWFSO is controlled through the PLC.

<u>Electrical supply is interrupted (instantaneous response – shuts down TTU)</u>

If the electrical supply is interrupted, the TTU will shut down and soil feed is shut down.

These automated provisions to shut down the soil feed ensure that the soils and air streams moving through the thermal treatment system will be treated under the project-specific design conditions. All critical operating parameters have measurement devices that produce a signal. The signals are input to the Programmable Logic Controller (PLC) which, in turn, generates a signal and controls the operation of other devices. Refer to the "Astec TTU System Interlocks" table attached as Appendix C for details. Once the TTU is brought up to the target operating temperature, it may be run in either an automatic or manual mode. The controllers have automatic settings which control the modulation of valves that control the processes.

To verify proper operation of the AWFSO features, each condition is tested or simulated during the start-up phase and the expected response documented. This can typically be done by temporarily moving the set-point for AWFSO into the normal operating range for the TTU to simulate an out-of-range condition. For instance, to test a low temperature response for the dryer or oxidizer exit temperatures, the minimum temperature set-point is raised to a level above the target operating temperature and the equipment operated for at least ten minutes to observe a waste feed shut-off response. Then the AWFSO setting is returned to its normal position. Each of the AWFSO features is similarly tested to demonstrate proper operation and the procedure documented in a log. An AWFSO Verification Log will be prepared by the thermal treatment contractor and submitted in the Test Burn Report.

Temperatures of the outlet from the dryer and oxidizer are measured using Type K thermocouples, with a 32 degrees Fahrenheit to 2,000 degrees Fahrenheit range with an accuracy of 0.05% (reference NIST-175) above 212 degrees Fahrenheit. These temperatures are recorded continuously via circle charts. Refer to Appendix D for three photographs that illustrate the thermocouples that are typical of the equipment, although they are not necessarily photographs of the mobile treatment unit. The first photo shows two thermocouple types. The mobile TTU uses the smaller diameter type of thermocouple for measuring both the dryer and oxidizer exit temperatures. The second photo shows the chute for soil exiting the dryer. The thermocouple is mounted on the side of the chute, near the lower panel so that the thermocouple protrudes into the soil stream. The third photo shows the oxidizer exit thermocouple. The oxidizer is on the right and the thermocouple is located below the flange toward the bottom of the picture. Similar to the thermocouple for measuring soil temperature, the thermocouple for the oxidizer protrudes into the air stream from the sidewall of the oxidizer. Example circle charts for the soil exit temperature and the oxidizer discharge temperature are also provided in Appendix D.

8.2.2 Thermal Treatment Unit Mobilization, Set-up and Start-up

The TTU is transported to the site on five main processing trailers and a control trailer. Ancillary equipment is transported on several flatbed trailers. Once on-site, the TTU is erected on an approximately 200' x 100', four-inch thick reinforced concrete pad with a load-bearing capacity of 3,000 pounds per square inch (psi). The TTU vertical components (oxidizer and evaporative cooling chamber) are supported by concrete footings.

Water, electricity and natural gas will be extended from existing on-site supplies to the TTU. The TTU requires approximately 85 gallons per minute (gpm) of water under typical operating conditions with approximately 65 gpm used to cool the treated air stream and approximately 20 gpm for hydration of the treated soils. Based on the expected treatment rate, usage rate for electricity is estimated at 16-20 kilowatt hours per ton. The maximum anticipated demand is 650 kilowatts. Natural gas is required to operate the two 42 million BTU burners internal to the TTU. The TTU natural gas supply system will be installed in accordance with the National Fire Protection Association requirements. The burners are expected to consume up to 2.1 million BTUs per ton of treated material.

Upon delivery to the site, the TTU will be appropriately configured for processing impacted soils. After initial functional testing, a start-up period of system calibration, zeroing, AWFSO verification, test burning and multi-point component inspection is necessary prior to commencement of full-scale treatment. The thermal treatment contractor will feed impacted soils into the TTU and will develop process data and identify the best operating conditions to optimize performance of the equipment. The dryer fill volume, residence time, burner firing rates, dryer inclination, infiltration air, etc. will be adjusted to optimize system performance. During the startup period, the thermal treatment contractor will conduct a series of 200-ton treatment campaigns at declining treatment temperatures to determine the appropriate operating temperature to meet the treatment criteria. Each treatment campaign will be processed at an anticipated reasonable soil treatment production rate. This will ensure that the system is effective in treating each of the potential constituents of concern for the EBCo site. Additional details regarding the test burn phase and related sampling are presented in Section 10.1.1.

8.2.3 Thermal Treatment Rate, Expected Throughput and Schedule

Based on the low moisture content of the on-site soil, the treatment rate for the project is expected to be approximately 700 tons per day or 15,000 tons per month. The actual treatment rate for this project will be determined during the startup period and could be varied during the interim measure depending on soil characteristics. The maximum soil feed rate will be established based on the feed rate experienced during the test burns and stack test, in response to specific recommendations made in the test burn and stack test reports. The unit is capable of operating in all weather conditions and will run 24 hours per day and six days per week. Some or all of the seventh operational day of each week will be dedicated to routine maintenance and inspections (refer to section 8.2.4). The thermal treatment contractor typically achieves an operating efficiency of approximately 90%, excluding the scheduled downtime for routine maintenance and inspections.

Based on the assessment of RFI soils data, a minimum of approximately 34,000 tons of soil will be treated. For general planning purposes, sixteen weeks of soil processing time is typically used with the understanding that the actual processing time could be more or less. Refer to section 11.0 of this work plan for a complete discussion of the overall project schedule.

8.2.4 Thermal Treatment Unit Operations and Maintenance

To supply operational power to the TTU, the thermal treatment contractor implements a 24-step start-up sequence. The start-up sequence is mandatory and is followed each time the TTU is operated. Start-up and operational controls for the TTU are located in a central control house. One Plant Manager is typically assigned to the control room. Each of the thermal treatment contractor's Plant Managers has a significant amount of training and project experience relative to operating the TTU. The TTU operator will coordinate closely with the on-going soil management activities taking place within the TTU operation area.

Continuous automated and manual component checks are performed while the TTU is in full-scale operation and an inspection log is completed for each day of operation. On the seventh day of each operational week, the TTU is shut-down for routine maintenance and inspections. During this weekly shut-down, inspection and maintenance is performed that is not feasible while the TTU is operating. This typically includes general maintenance of the rotary dryer and pugmill components and addressing observations logged during the previous week's daily inspections. In addition to the Plant Manager, the thermal treatment contractor operations team will include trained maintenance personnel to perform maintenance activities associated with the TTU. At the site, the thermal treatment contractor will maintain an Equipment Operations and Maintenance Manual for operation and maintenance of the TTU. This manual can be made available to DSHW, if requested.

8.2.5 Thermal Treatment System Water Management

Water supplied to the TTU pugmill and evaporative cooling chamber is immediately converted to the gas phase and remains in a gas phase. As a result, there is no water discharge associated with the TTU operation other than steam exiting the exhaust stack.

Concrete sumps will be incorporated into the concrete pad operation area footprint to collect storm water runoff, as necessary. For the EBCo site, excavated soil is expected to have low moisture content and, therefore, the need for management of excess soil moisture within the soil preparation area is not expected. If rain occurs, untreated/staged soil stockpiles in the soil preparation area will be covered to the extent feasible in order to prevent infiltration of moisture into the soil. Nonetheless, in the event that soil moisture drainage and/or storm water accumulate in the operation area sumps, it will be collected and delivered to EBCo's existing waste water treatment system. Accumulated solids within the sumps will be manually removed and processed in the TTU with the final batch of treated material.

8.2.6 Thermal Treatment System Dust Control

Dust control measures, in accordance with the Fugitive Dust Control Plan prepared by thermal treatment contractor for the thermal treatment activities, will be implemented. The Dust Control

Plan has been submitted to the DAQ as part of the Notice of Intent for the air permit. Prior to and within the soil preparation area, dust control via wetting the feed soil is generally not performed due to the fact that additional soil moisture will decrease the thermal treatment rate. However, dry soils will be moistened, as needed, or covered during soil preparation and handling to comply with the Fugitive Dust Control Plan and to control dust emissions. Once in the TTU, process dust is collected and managed internally including a soil re-hydration step inside the pugmill. As a result, dust control measures (re-hydration) are already applied to the treated soil before it exits the TTU.

A discussion of dust control measures relative to the overall on-site soil management operations is provided in section 8.4.8.

8.2.7 Thermal Treatment System Demobilization

Upon completion of soil treatment operations, the TTU is decontaminated on-site. The demobilization criteria for the TTU will be "visibly clean" on exterior surfaces. Clean soil will be heated and processed through the TTU at the end of the project to decontaminate interior components, including all process air treatment components.

Decontamination, disassembly and demobilization of the TTU from the site can be completed within 30 days following the conclusion of full-scale treatment operations. However, it will not be a requirement that the TTU equipment be removed from the site on a particular schedule. The particular schedule for removing the equipment from the site will be a matter of discussion between EBCo and the contractor.

8.3 Project Team Qualifications and Responsibilities

This section describes the qualifications, roles and responsibilities of the key project team members for the interim measure program. Statements of Qualifications for the contractors and resumes of key personnel are available, if requested by DSHW.

8.3.1 Prime Contractor

The prime contractor for the interim measures project is EQ Northeast, Inc. (EQNE). EQNE is a full service transportation and remediation company with extensive capabilities and experience in transporting and remediating hazardous wastes, including the excavation and management of soils impacted with energetic constituents. EQNE will perform project and site management and will manage the overall site remediation work. EQNE will also perform on-site excavation, transportation, stockpile management and site restoration.

EQNE's Project Manager for the interim measures activity is David Ciroli. Mr. Ciroli has over fifteen years of field remediation project management experience and will be responsible for EQNE operations at the site. Mr. Ciroli will typically be physically present at the site twice per month for a number of days. An EQNE site superintendent will be present at the site full time and will manage day-to-day operations of EQNE staff and subcontractors to EQNE.

8.3.2 Thermal Treatment Contractor

EQNE has selected Environmental Soil Management, Inc. (ESMI) to perform on-site thermal treatment. ESMI will be responsible for activities related to the thermal treatment of soils. ESMI was formed in 1990 and operates three fixed thermal treatment facilities similar to the design of the mobile unit, in New Hampshire, New York and New Jersey. In 2000 ESMI acquired the mobile thermal treatment equipment that will be used on this project. This mobile thermal treatment unit has recently been used at the Massachusetts Military Reservation (MMR) for the treatment of 55,000 tons of soils containing energetic materials. ESMI is a leading provider of direct-fired thermal remediation services and has successfully treated more than 2.4 million tons of soils through thermal treatment since 1992.

Phillip Theriault is the Manager of Onsite Treatment Services for ESMI and is ESMI's project manager for the interim measures thermal treatment activity. Mr. Theriault has functioned as project manager in charge of technical review on numerous thermal treatment projects. Mr. Theriault will provide overall management of ESMI's operations at the EBCo site. Brian

Yearick is the thermal treatment system operator and will be responsible for day-to-day operations at the EBCo site. Mr. Yearick is an engineer and has over eight years of experience as a thermal treatment system operator. It is anticipated that ESMI will have three rotating crews of four people at the site under the supervision of Mr. Theriault and Mr. Yearick.

8.3.3 Excavation Contractor

EQNE has selected Ron Price Excavating as a key excavation subcontractor for the interim measures project. Mr. Price has performed excavation services at EBCo for over twenty years and has extensive experience at the EBCo site including the excavation of soils containing energetic materials. Mr. Price was integral in the successful completion of interim measures at SWMU 27, is knowledgeable in EBCo safety procedures, and his on-site experience in recognizing and handling energetic materials will facilitate a safe and efficient excavation program. Mr. Price will work closely with EQNE and EBCo while performing excavation and soil management services in support of the interim measure.

8.3.4 Company/Owner

EBCo is the owner of the property at which the interim measures will be conducted. EBCo personnel have extensive experience in the manufacture and handling of energetic materials. EBCo's environmental and safety professionals will take primary responsibility for developing and/or approving procedures for the safe handling of reactive and potentially reactive materials including soils containing elevated concentrations of CEMs, nitrostarch or other materials that could be encountered during excavation. EBCo will review excavation and materials handling procedures to ensure that interim measure activities are conducted in a manner consistent with the safe handling of energetic materials.

8.3.5 Consultant

Charter Oak Environmental Services, Inc. (Charter Oak) will be the technical consultant to EBCo and the Spanish Fork Technical Committee (the clients) for the interim measures program.

Charter Oak is currently managing the RCRA corrective action program at the EBCo site and is implementing the corrective action plan for off-site ground water remediation. Charter Oak will provide technical management of the interim measures project on behalf of the clients. Charter Oak's assignments will include, but are not limited to: liaison with DSHW and other regulatory agencies involved; participation in public presentations; preparation of this interim measures work plan and certain other permits/proposals supporting the interim measures program; general project coordination with the clients, EQNE, ESMI, Ron Price Excavating and other subcontractors; delineating soils subject to the interim measures program; collection, management and evaluation of treated soil samples; collection, management and evaluation of post-excavation samples; and project observations and recordkeeping.

Mark Franson, President of Charter Oak, will serve as the project director for the interim measures project. Mr. Franson will be responsible for overall project coordination and management and will be present at the site on an approximately monthly frequency. Mr. Franson will also be the primary point of contact with project managers for EQNE and ESMI. Paul Torcoletti and Michael Novak will be responsible for day-to-day coordination of on-site staff. Mr. Torcoletti and Mr. Novak will also have primary responsibility for developing sampling plans, implementation of the Quality Assurance Project Plan (QAPP) and evaluation of analytical data from treated soils and post excavation samples. Mr. Torcoletti and/or Mr. Novak will visit the site periodically to provide assistance to on-site staff, review project field records and to evaluate adherence to the QAPP. John Garr and Lance Kovel will serve as the on-site project managers for Charter Oak. Both Mr. Garr and Mr. Kovel have extensive experience in managing and documenting large soil remediation projects and one will typically be present on-site during each day-time shift during excavation and thermal treatment activities. Mr. Garr and Mr. Kovel will be responsible for on-site inspection, tracking of soils, sample collection, project recordkeeping and supervision of participating project staff.

8.4 Description of On-Site Soils Management

The following sections describe the various aspects of on-site soil management operations. Refer to Figure 8-3 for a schematic depiction of the overall on-site soil management operations.

8.4.1 General Excavation and Soil Management Plan

Excavation areas and depths will be determined and delineated by Charter Oak prior to the start of excavation activities. EQNE will develop an excavation plan to maintain an adequate daily supply of soil so that the thermal treatment equipment may be operated with maximum efficiency. EQNE expects to initiate excavation work approximately two to four weeks prior to the start of full-scale thermal treatment. Excavated soils will be stockpiled in the storage CAMU until thermal treatment operations commence. A stockpile of soils will typically be maintained in the storage CAMU during the interim measure to serve as a source of material for those times when active excavation activities do not deliver a sufficient quantity of soils for daily operation of the TTU. Once excavation activities are completed at other locations and the storage CAMU is no longer necessary for soil management, the storage CAMU will be emptied and excavation will commence in this area, as necessary.

Prior to the start of each excavation, the areas will be cleared for utilities, and representatives of EBCo, EQNE, Ron Price Excavating and Charter Oak will conduct a safety meeting to review the particulars of each excavation area. Information regarding process history, constituent concentrations and excavation limits will be presented to the project team. EBCo will also present procedures to be followed if unexpected energetic materials are uncovered during excavation. Such findings will be managed as described in Section 8.4.7. At the start of each excavation, EBCo will typically have a representative present and Ron Price Excavation will begin the physical excavation. Once EBCo has determined that no unexpected conditions or other specific safety concerns are present, the remaining excavation activities may be continued or completed by EQNE as resources may be best applied.

As depicted in Figure 8-3, there are four general categories of soils to be managed:

1. Soils with <2% total CEMs;
2. Soils with >2% total CEMs;
3. Soils that contain lead concentrations in excess of risk-based criteria; and,
4. Nitrostarch mixed with soils.

The procedures specified in the following sections will be followed to ensure that no hazardous remediation wastes will be processed through the TTU.

8.4.1.1 Soils with <2% CEMs

Soils having total CEM concentrations of <2% will be excavated and delivered to either the storage CAMU for interim stockpiling or taken directly to the treatment CAMU where they will be weighed, prepared and processed as described in Section 8.3.1.1. A small quantity of soils in this category contain primarily PAHs with associated petroleum hydrocarbons, and may be shipped directly off-site for disposal without thermal treatment.

8.4.1.2 Soils with >2% CEMs

Soils having total CEM concentrations of >2% are present within several specific excavation areas. Where this condition exists, it tends to be limited to surficial soils in the upper six inches to less than one foot of the soil column. Therefore, management of these excavation areas includes *in-situ* blending with a sufficient quantity of underlying, soils until the resulting total CEM concentration will be <2%. This blending procedure will be implemented to ensure the safe handling and processing of these soils so that they do not exhibit the reactivity characteristic when excavated and to provide a more consistent feed concentration into the TTU. Because excess soil moisture is undesirable for thermal treatment, blending will ideally be accomplished without the addition of water; however, the soils will be moistened to the extent necessary as determined by EBCo to address safety concerns or for dust control. Areas where blending will occur will be designated as Areas of Contamination (AOCs) (EPA guidance, March 13, 1996 EPA memo, “Use of Area of Contamination Concept During RCRA Cleanups.”) as depicted in Figure 8-1. Blending soils in-situ within AOCs is consistent with EPA’s Area of Contamination guidance referenced above.

Once the soils are blended, the blended soils will be delivered to either the storage CAMU for interim stockpiling or taken directly to the treatment CAMU where it will be processed as described previously. Prior to thermal treatment, EQNE and ESMI may mix these blended soils with other soils to further distribute CEM concentrations to provide a more homogeneous concentration feed into the TTU. This additional mixing will occur within either the storage CAMU or the treatment CAMU.

8.4.1.3 Soils That Contain Lead

An estimated 3,000-5,000 tons of soils with lead concentrations in excess of applicable risk-based concentration levels are present at SWMUs 1, 11, 28, 30, and 31. The majority of these soils, found mostly in SWMUs 28 and 31, contain only low (less than two percent) concentrations of CEMs. These soils will be excavated and temporarily stockpiled adjacent to the work area or at a designated temporary staging area. The stockpiles will be set on and covered by plastic sheeting to minimize contact with underlying soils and to limit dust emissions. The temporary stockpiles will be chemically characterized and delivered directly to an off-site disposal facility without thermal treatment. A description of the protocols for characterization and off-site disposal of lead-impacted soil is provided in section 8.5.

A portion of soils containing elevated lead, identified in portions of SWMUs 1 and 30 along the former wastewater conveyance ditch and in the southern end of the north impoundment, also contain relatively elevated levels of CEMs, some of which may exceed two percent CEMs. Approximately 2,400 tons of soil contains lead concentrations that may exceed the TCLP level of 5.0 mg/L. Prior to excavation, soils that are known or suspected to exceed the TCLP level of 5.0 mg/L will be stabilized so that the TCLP level for lead is less than 5.0 mg/L. These areas will be designated as an AOC and the following in-situ treatment will be performed. A lead stabilizing agent (typically Portland cement) will be applied to the surface of the area and mixed with the upper foot of soil using agricultural tilling equipment. Additional in-situ blending will be performed, as needed, to ensure that the resulting soil mixture contains less than two percent CEMs. Samples of this stabilized soil will be collected at a rate of one sample per 100 cubic yards to verify that they do not contain TCLP lead concentrations in excess of 5.0 mg/L.

These soils will then be excavated and processed through the TTU to remove CEMs and other organic constituents that may be present. These soils will be tracked and segregated from other treated soils, both before and after thermal treatment. These treated soils will then be characterized and managed as described in Section 8.5.

8.4.1.4 Nitrostarch Soils

As described in Section 7.1, a small quantity of nitrostarch product is found mixed with soils within SWMU 26. EBCo and ESMI are developing specific protocols and procedures for the management of this material.

In order to safely excavate the nitrostarch and soil mixture, the area will be wetted using sprinklers in a similar manner as to those procedures used in the SWMU 26 nitrostarch delineation. This procedure renders the nitrostarch wetted to a moisture content of greater than five percent. At a five percent or more moisture content, the soil can be managed since it does not exhibit the characteristic of reactivity.

The primary alternative under consideration is manual excavation of the wetted nitrostarch and placing it into containers (tightly woven linen bags are currently under consideration). The selected containers will not be plastic bags or other materials containing chlorine or chlorinated compounds. The containers will contain nitrostarch in a wetted condition; therefore, these containerized materials will not exhibit the reactivity characteristic. These containers will then be brought directly to the treatment CAMU where they will be hand-loaded into the TTU. The quantity of nitrostarch that can be placed in each container and the rate at which the containers can be placed into the TTU has not been determined at this time, but will be part of the final protocol.

Alternatively, the nitrostarch may be excavated and open-burned on-site under an emergency burn authorization. In that case, only the surrounding soils (containing less than two percent CEMs) in the nitrostarch excavation area will be managed in the TTU, using the excavation and soils management methods applied to other soils containing CEMs. The potential open-burning activity is not part of this interim measures work plan; therefore, it is not discussed further.

Trained EBCo personnel will initiate all activities within nitrostarch-impacted areas and will make determinations regarding the status of all nitrostarch-impacted soil prior to management of that material.

8.4.2 Treated Soils Management

Soils processed through the TTU will be temporally stockpiled within the treatment CAMU in the treated soil staging and characterization area (see Figure 8-3). Segregated stockpiles will be maintained within the treatment CAMU, each representing eight hours of soil treatment (three segregated soil stockpiles per day). Treatment confirmation samples representative of each eight hour stockpile will be collected following the protocols presented in Section 10.0. Stockpiles that meet the treatment criteria will then be delivered to the final stockpile storage area or in the case of soils containing lead in excess of risk-based criteria, delivered to an off-site disposal facility. In order to provide for operational flexibility and to allow for possible retesting of some soil piles, the final stockpile area may also be used to store treated stockpiles for which additional characterization may be needed. In such cases these stockpiles will remain segregated until additional characterization data is available and successful treatment is confirmed.

Soil stockpiles that do not meet the treatment criteria will be returned to the TTU for additional treatment. Upon further treatment, the re-treated stockpile will be sampled to confirm that treatment criteria have been achieved.

Due to the time required to complete data validation, it is a logistical necessity that the treatment confirmation be determined based on pre-validated data. Once soils are cleared for placement in the final treated soil stockpile they cannot be retrieved from the final stockpile. Validated data will be provided in the *Interim Measures Report* and final RFI risk assessment of the treated soils will be conducted on validated data. Data validation is addressed in Section 10.3.

A Treated Soil Stockpile Verification Form will be maintained for each independent stockpile of treated soil. This form will be used to track each stockpile from creation date to final consolidation in the treated soil stockpiles. A checkbox will indicate compliance with the treatment goals. If treatment goals are not met, this will be noted on the form along with the identification and concentration of constituents that did not meet the treatment goals. Stockpiles that do not meet treatment goals will be reprocessed through the TTU. Stockpiles requiring reprocessing will be tracked using new forms cross-referenced to the original form. An example of this form is included in Appendix G. This and other forms provided in Appendix G may be modified.

8.4.3 Management of Debris

"Debris" is defined in 40 CFR 268.2(g) as "any solid material exceeding a 60 mm particle size that is intended for disposal and that is either a manufactured object, plant or animal matter, or natural geologic material." The screening process described in section 8.4.1 will produce primarily rock material that is 63.5 mm (2.5" screen) or greater, which will be managed as debris. Based on available information and site-specific knowledge, the debris will not contain listed hazardous wastes nor will the debris exhibit a hazardous waste characteristic. Therefore the debris will not meet the definition of hazardous debris as defined in 40 CFR 268.2(h). However, if hazardous debris is identified, this debris will be managed in accordance with 40 CFR 268.45.

Based on available information from soil borings, trenches, geological maps and references, approximately less than one percent of the total excavated material is expected to be removed by the screening process and managed as debris. The debris will consist primarily of cobbles. Because of the typically low moisture content of on-site soil, significant adhesion of soil to the screened debris is not expected. Nonetheless, twice-screened debris stockpiles will be visually inspected to verify that residual soil is removed from the debris surface and a clean debris surface has been achieved. Debris that does not pass visual inspection will be re-screened until a visually clean surface is observed. Debris having a visually clean surface will consist of a large mass of rock and possibly a thin film of residual soil having a much smaller mass relative to the rock matrix. Therefore, potential constituent concentrations in the debris will be extremely low. Achieving a visually clean surface provides sufficient evidence that the debris to be managed on-site will not exceed applicable risk levels. Visually clean debris will be used as fill material or as road base on the site

8.4.4 Final Stockpile Management

The final treated soil stockpiles will be located in the areas depicted in Figure 8-1. The upper layer of the soil stockpile(s) will be amended as necessary to support vegetation, and hydroseeded using a seed blend recommended by a local hydroseed contractor. The vegetation will be maintained to promote plant growth and to control wind and rain erosion. These soils will eventually be used to backfill excavations upon completion of additional future corrective action that may be required.

Treated soil stockpiles with non-detectable COPC concentrations (as determined in the treated soils analytical protocol) may be segregated from the treated soils that contain detectable COPC concentrations. The soil containing non-detectable COPC concentrations will be considered to contribute no measurable risk to the site and may be stockpiled outside of existing SWMU boundaries, if necessary. Segregating these two stockpile types would allow for additional flexibility in managing the stockpiles and in decisions regarding the backfilling of excavations.

8.4.5 Open Excavation Management

During the interim measures activities, the excavations will generally fall into one of three general categories as described below.

Category 1: Shallow excavations presently serving as an interim measure activity only.

Category 1 excavations represent areas where remedial excavation during the interim measure activity may not meet the criteria for a final corrective action. Assignment of this category to an excavation will be based on post-excavation analytical data and criteria approved by DSHW on a case-by-case basis.

Category 1 excavations will be shallow enough to leave the excavation footprint open without creating a safety hazard at the site, in the event that future final corrective action is required. The criteria for determining that an excavation can be safely left open will be the technical practicality of establishing a 1:2 (vertical:horizontal) slope along the entire perimeter, without utilizing backfill material.

Category 2: Deeper excavations presently serving as an interim measure activity only.

Category 2 excavations also represent areas where remedial excavation during the interim measure activity may not meet the criteria for a final corrective action. Assignment of this category to an excavation will be based on post-excavation data and criteria approved by DSHW on a case-by-case basis.

Category 2 excavations are typically deep enough that establishment of a 1:2 perimeter slope is not technically practicable without utilizing backfill material. Following excavation of impacted soil to the target interim measure depth, filter fabric will be placed in the excavation to demark the starting point for potential future final corrective action. The excavation will then be backfilled with clean material until a 1:2 perimeter slope is achieved. Successfully treated soil is considered to be clean for these purposes.

Category 3: Excavations serving as a final corrective action (shallow or deep).

Category 3 excavations are those for which remedial excavation during the interim measure activity meets the criteria for a final corrective action. Assignment of this category to an excavation will be based on post-excavation data and criteria approved by DSHW on a case-by-case basis.

Category 3 excavations are completed to the target depth, backfilled with clean material, amended as needed to support vegetation and seeded as a final corrective action.

Treated soil that meets the treatment criteria is considered to be clean material and may be used for backfill. Segregated treated soil with non-detectable COPC concentrations will be considered to contribute no measurable risk to a SWMU when placed on the site.

8.4.6 Site Survey

The excavation limits, as determined by Charter Oak's evaluation of the RFI data, will be surveyed prior to the start of physical interim measures and will be delineated with stakes and flagging. Final excavation limits and depths, as well as the dimensions of the final treated soil stockpile will be surveyed upon completion of the interim measures. The locations and elevations of post-excavation sample locations and elevations will be surveyed and marked in the field with stakes and flagging.

8.4.7 Identification and Management of Special Materials

Although the site history and conditions have been well established through the RFI process, it is possible that unanticipated energetic materials could be encountered during excavation. Ron Price Excavating has extensive experience in recognizing these materials and if encountered, excavation work in the subject area will cease immediately. EBCo will be notified and they will establish a procedure to safely identify and manage these materials. EBCo will determine appropriate procedures on a case-by-case basis, as needed. Excavation of other areas and thermal treatment will proceed while procedures to manage special occurrences are developed and implemented.

8.4.8 Dust Control

In accordance with the Utah Division of Air Quality (DAQ) Fugitive Dust Rule (R307-309), a fugitive dust control plan, for all of the interim measures activities, will be submitted to the Executive Secretary of the DAQ prior to starting on-site operations. This plan is in addition to and incorporates the dust control plan submitted with the air permit application. The fugitive dust control plan will identify potential sources of dust emissions and dust control strategies that may be implemented, including the potential for moistening soils during excavation and handling and the wetting of unpaved haul roads. The fugitive dust control plan will be developed by EQNE, and they will be responsible for controlling dust emissions in accordance with the plan.

8.4.9 Field Observation

Charter Oak personnel will observe excavation activities and be present during each day-time shift to monitor the excavation work and adherence to plans and permits, collect treatment samples and track soil management. Charter Oak will ensure that stockpiles containing lead are appropriately segregated for characterization and off-site disposal. Charter Oak will also ensure that treated stockpiles that did not meet treatment criteria are segregated for additional testing and/or re-treatment. Charter Oak will collect post-excavation data as each excavation area is completed. Upon review of the post-excavation analytical results, Charter Oak, in consultation with EBCo, will determine if additional excavation is desirable. EQNE and ESMI will provide operating records and soil weight records to Charter Oak on a daily basis.

8.5 Off-Site Landfill Management of Soils Containing Lead

8.5.1 Identification of Soils Containing Lead in Excess of Risk-Based Criteria.

Soils with lead concentration in excess of applicable risk-based concentration levels have been identified in SWMUs 1, 11, 28, 30 and 31. These areas are approximately delineated on Figure 8-4 based on RFI soils data. Soils will have already been removed from SWMU 11 during closure of this unit. The hatched areas represent soils with low concentrations of CEMs that will be transported directly to an off-site disposal facility without thermal treatment. The stippled areas indicate soils where elevated CEMs are also present. These soils will be thermally treated prior to off-site disposal.

8.5.2 Chemical Characterization for Off-site Disposal

Stockpiled soils will be characterized in accordance with the requirements of the disposal facility. At a minimum Toxicity Characteristic Leaching Procedure (TCLP) lead will be analyzed.

8.5.3 Disposal of Soils Containing Lead

Depending on the waste characteristics, the soils will be managed as follows:

- Soils having a TCLP lead concentration of less than 5.0 mg/L (as determined using SW-846 Chapter 9 characterization methods) will be managed in a RCRA Subtitle C or D landfill. This assumes that available data or waste characterization shows that these soils are not characteristic or listed hazardous wastes for reasons other than the presence of lead.

- Soils that have a TCLP lead concentration that is greater than or equal to 5.0 mg/L (as determined using SW-846 Chapter 9 characterization methods) will be disposed of at a RCRA Subtitle C hazardous waste landfill. Alternatively, these soils may be stabilized on-site to reduce the TCLP lead concentration to below 5 mg/L and then managed accordingly.

- Soils that have a TCLP lead concentration in excess of the Universal Treatment Standard of 7.5 mg/L will be stabilized off-site prior to disposal at a RCRA Subtitle C hazardous waste landfill. Alternatively, these soils may be stabilized on-site to reduce the TCLP lead concentration to below 5 mg/L and then managed accordingly.

8.6 Recordkeeping, Daily Reporting and Remote Data Access

8.6.1 Project Records

A variety of project records will be developed during the interim measures program. This section describes the recordkeeping requirements for the interim measures program.

- Daily operating logs will be maintained by ESMI using their customary and proven documentation procedures. Daily records will include tons treated, treatment rate, treatment temperature (using both a circle chart and electronic monitoring) and other operating and monitoring parameters. ESMI will provide records of daily operating conditions to Charter Oak in a combination of paper and electronic format as described herein.

- Operations and maintenance records for the thermal treatment equipment will be maintained by ESMI. Thermal treatment unit inspection forms will be completed daily.
- Charter Oak will maintain daily field logs in bound waterproof field books. The field logs will document daily activity including weather conditions, excavation work, stockpile management, tons of soil processed, treatment sample collection, post-excavation sampling, compliance with plans and permits and other routine tasks.
- Charter Oak will maintain standard environmental field forms including but not limited to chain-of-custody forms and sample collection forms.
- Charter Oak will maintain a bound waterproof field book dedicated as a survey log. Only information pertaining to site survey activities will be maintained in this survey log.
- EBCo (originals) and Charter Oak (copies) will maintain shipping records, non-hazardous waste manifests and hazardous waste manifests for materials transported to off-site disposal facilities.
- Charter Oak will receive and maintain analytical data reports from the contract laboratories in both paper and electronic (PDF files and electronic data deliverables) format.

During the project, records will normally be kept at the project site by a combination of Charter Oak and EBCo. On a regular basis, copies of records will be made and also maintained at Charter Oak's offices in Salt Lake City.

8.6.2 Daily Reporting and Remote Data Access

For the project periods as requested by DSHW, daily raw data reports, remote data access and daily operator logs (blank form attached as Appendix E) will be provided to DSHW. At a minimum, these daily reports will be provided to DSHW for at least the first four weeks of full-scale operation. At the sole discretion of DSHW, these reports may be discontinued, in whole or in part, after the first four weeks if it is found that continuing these reports, in addition to the remote data access, is not necessary or useful. The purpose of these reports and remote data access is to provide DSHW with critical operating data in raw form, as it is generated, for their review and consideration. In general, information that is accessible by remote access will not also be provided in the daily reports. The daily data will typically be provided as image (pdf scanned documents or Acrobat converted files) electronic copies. Therefore, a completed daily report will be delivered by e-mail from Charter Oak's Salt Lake City office. The following information will be provided in the daily reports:

- Sample collection forms for treated soil piles;
- Sample collection forms for post-excavation areas;
- Pre-validated laboratory analytical data, without associated QA/QC, for treated soil samples;
- Pre-validated laboratory analytical data, without associated QA/QC, for post-excavation soil samples;
- Circle charts for temperature of soil exiting the dryer;
- Circle charts for temperature of air exiting the oxidizer; and,
- Daily operator logs with typically a one day lag.

The information for the previous day will be compiled in the Charter Oak, Salt Lake City office and emailed with a standardized cover sheet indicating what information was conveyed. Although email delivery of image files will be the preferred daily reporting format, hardcopies may also be faxed to DSHW.

In addition to the daily reports, remote data access will be provided to DSHW. Unlike the daily reports, which may be discontinued, in whole or in part, after four weeks at the sole discretion of DSHW, remote data access will be continued for the life of the project. Although the specific hardware and software details are being developed, the end result will be the ability for DSHW staff to access the specified data from their Salt Lake City computers using a password-protected system. For each item being measured (as listed below), the recorded data will be at a frequency of one measurement per minute. Therefore, the real-time data accessed would be presented on the basis of one data point per minute in a spreadsheet or other usable format. There may be instances when remote access is not possible due to technical issues beyond our control. If such an instance occurs, appropriate measures will be taken to restore the remote access link in a timely fashion. Temporary loss of the remote data access will not result in the suspension of treatment operations.

The following data will be available by remote access:

- Soil feed rate (tons per hour).
- Soil temperature exiting the dryer (degrees Fahrenheit).
- Gas temperature exiting the dryer (degrees Fahrenheit).
- Oxidizer / afterburner exit temperature (degrees Fahrenheit).
- Temperature of air entering baghouse (degrees Fahrenheit).
- Baghouse pressure differential (negative pressure in inches of water column).
- Carbon monoxide and oxygen from continuous emissions monitoring (ppm volumetric).

Indirectly, through the remote data access, DSHW will be able to monitor a TTU system shutdown due to the rare event of a loss of water, gas or electrical supply. Loss of these utilities will be regarded as an upset condition and will be reported by telephone to DSHW. The effect of the loss of each of these critical supplies is described below.

- Water supply interrupted – In this event, a high temperature in the air entering the baghouse is experienced and shuts down the TTU.
- Gas supply interrupted – Gas supply is monitored, in part, by a UV flame detection device, however, this information is not logged. In the unlikely event of loss of the gas supply, the system is shut down by a UV flame detector; however, the DSHW will see this event as a sudden decrease in both the dryer and oxidizer temperatures.
- Electrical supply interrupted – As a practical matter, all electrical devices (including the dryer drum, belts, etc.) shut down due directly to the loss of power. The PLC (computer) has a battery backup for some limited period of time. Loss of electricity triggers the same conditions as a loss of gas supply and a sudden loss of temperature is observed.

Data provided by remote access will not also be provided in the daily reports.

Other logs and data will be maintained at the TTU, such as dryer negative pressure measurements.

8.6.3 Weekly Project Progress Updates

In addition to the daily reporting described in the previous section, EBCo representatives will participate in weekly teleconferences with DSHW staff. The weekly teleconferences will address accomplishments and any technical issues associated with the implementation of this work plan. A regular schedule will be established for these teleconferences based on consultation with DSHW.

8.6.4 Final Document Retention and Storage

Unless otherwise specified by DSHW, at the completion of the project, copies of records that require retention will be maintained by Charter Oak at their Salt Lake City Office. During the project, records will be primarily available at the site. Non-hazardous and hazardous waste manifests will be maintained by EBCo in accordance with applicable regulations.

9.0 SITE SAFETY

9.1 EBCo Responsibilities

Site safety is a primary concern during the interim measures program. EBCo expertise and personnel have primary responsibility to determine safe procedures for the work involving CEMs. EBCo personnel will be actively involved in the site work to provide safety oversight.

9.2 On-Site Contractor Responsibilities

Each contractor will operate under a site-specific health and safety plan consistent with EBCo's policies and procedures. Each contractor and associated subcontractor will adhere to their site-specific health and safety plan.

9.3 Site Visitor Responsibilities

DSHW personnel and other visitors to the site will be subject to these site safety procedures and EBCo safety policies. Visitors to the site will be escorted at all times by an EBCo representative or other members of the project team, in accordance with EBCo policies and procedures.

10.0 SAMPLING AND ANALYSIS

The following sections describe soil sampling and analysis that will be performed during the interim measures program. Information regarding the quality assurance project plan and data quality objectives is also provided.

10.1 Treated Soil Sampling and Analysis

Treatment sampling will be conducted in three phases as described below.

10.1.1 Test Burn Period

As described in Section 8.2.2, four to five 200-ton treatment campaigns will be completed during the TTU startup phase. It is expected that the test burn period will be completed within two to three days. The primary objective of the test burns is to establish optimal operating conditions for full-scale treatment operations and to determine appropriate treatment temperatures to achieve the target treatment goals. Under the optimal conditions, a soil feed rate of 40 tons per hour for full-scale operations should be possible. Therefore, the treatment campaigns will target this feed rate. A secondary objective is to evaluate what analytical parameters may be eliminated from the full-scale monitoring program. The thermal treatment system will be operated at temperatures sufficient to mineralize CEM compounds (expected to be approximately 600^{o}F) and to treat other organics such as petroleum hydrocarbons and VOCs. Based on ESMI's experience treating soils that contain VOCs and petroleum hydrocarbons, the temperatures necessary to thermally decompose CEMs exceed the temperatures required to desorb volatile organics and petroleum hydrocarbons from soils. Furthermore, with the exception of a few locations (e.g. SWMUs 17 and 30), VOC and petroleum hydrocarbon concentrations in soils that will be subject to treatment are very low (see Table 7-1 for average treatment volume concentrations). Demonstration that CEMs have met the treatment criteria should be sufficient evidence of successful treatment of VOCs and petroleum hydrocarbons. Sampling conducted during the test burn phase are intended to confirm that sampling for VOCs and petroleum hydrocarbons will not be necessary during full-scale operations.

A relatively small quantity of soils containing PAHs and their associated petroleum hydrocarbons will be segregated from SWMUs 17 and 24. Some of these soils may be shipped off-site for disposal without thermal treatment. To the extent that some of these soils are treated in the TTU, they will be treated on a segregated basis. The soil exit temperature of the TTU will be elevated to between 800°F and 900°F for the purpose of treating these soils only. Post treatment soil analysis for these segregated soils will include SVOCs, as described below.

Under the direction of Charter Oak, the contractor will create an approximately 1,000 cubic yard (~1,400 to ~1,600 tons) test burn stockpile that is intended to be representative of above-average soil concentrations for the classes of organic constituents (i.e. CEMs, VOCs, petroleum hydrocarbons, etc.) subject to thermal treatment. While there is no guarantee that each individual constituent that was detected in site soils during the RFI will be present; each chemical class, with the possible exception of SVOCs, will be represented in the test burn stockpile at above average concentrations. Because each chemical class has similar chemical and physical properties, the presence of one or more constituents from a chemical class will provide an accurate measure of TTU performance during the treatment campaigns. Based on the RFI soils data, the test stockpile will consist of soils excavated from some or all of the following areas:

CEMs	SWMUs 1, 15, 18 and 30
VOCs	SWMU 30
TPH (DRO/MO)	SWMU 30

Appendix F presents a table summarizing RFI soils data for the locations that will likely comprise the test stockpile. Also included in Appendix F is a second table summarizing the location, primary constituent class, USCS soil classification and estimated volume that will be excavated from each location. The locations selected are representative of the some of the highest constituent concentrations for each chemical class present at the site that will be processed through the TTU for the test period. Soils having total CEM content of 2% or greater will be mixed *in-situ* with underlying soils to arrive at a final CEM content of <2% prior to incorporation into the treatment stockpile.

The test stockpile will be located in the treatment CAMU. Once established, the test stockpile will be thoroughly mixed using heavy equipment and will serve as the source of soils for each 200-ton treatment campaign. The stockpiled soils will be managed and prepared as described in the Section 8.2.1.1. It is an objective for this test stockpile to typically contain above-average concentrations of the COPCs representative of the site. Further, it is an objective for the stockpile to contain 1,000 mg/kg or higher RDX and TNT and 50 mg/kg or more HMX for the removal efficiency demonstration. In the case of HMX, there is a limited amount of soil with elevated concentrations of HMX. It is a preference to have a single large test stockpile containing all three of these COPCs at their minimum target concentrations. However, if it becomes apparent that there is insufficient HMX to achieve the target concentration, a back-up plan will be implemented. In order to preserve the opportunity to implement the back-up plan, a segregated 200 ton soil stockpile comprised of soils containing HMX concentrations of 100 mg/kg or more will be prepared first. If necessary, this back-up stockpile will be processed through the TTU under the optimal operating conditions established by ESMI via the treatment campaigns. If the back-up plan is not needed, then the segregated 200 ton stockpile may be blended into the test burn or stack test stockpiles. Successful treatment of the stockpile(s) will demonstrate that the selected operating conditions will be appropriate for the effective treatment of soils at the site. In addition to documenting treated soil concentrations below the treatment goal concentrations, a successful demonstration will include calculation of a removal efficiency of at least 99% for RDX, TNT and HMX. Soil samples will be collected during each 200-ton test campaign as described herein.

A minority quantity of soils on the site requiring corrective action exhibit the high CEM concentrations summarized in Appendix F. Even among the soils selected for the test burns, the concentrations of CEMs decrease significantly with depth. It is the intention of the test burn program to simulate above-average conditions that are realistically representative of the full-scale project. This includes mixing >2% CEMs, present in surface soils, in place with underlying soils, prior to excavation. The resulting soils removed for the test burns will be representative of higher than average concentrations. Since one of the objectives of the test burn program is to demonstrate the feasibility of the expected throughput, close attention will be paid early in the program to any restrictions to the throughput based on soil concentration. If the resulting soil concentrations for the test burn materials are much higher than average and if that condition results in a lower throughput, the test burn stockpile may be remixed to lower the CEM content somewhat. In any event, the CEM content of the test burn stockpile will be above average conditions for the corrective action soils. Soil management during full-scale excavation, stockpiling and feeding into the TTU will be designed to deliver CEM concentrations not typically higher than those used to establish the optimal TTU operating conditions.

A total of four feed soil composite samples, each representative of approximately 50 tons of soils will be collected during each 200-ton treatment campaign prior to being processed in the TTU. Each composite sample will consist of five grab aliquots each representative of approximately ten tons of soil. For example, assuming a soil feed rate of 40 tons an hour, each aliquot would be collected at about 15-minute intervals. The sample aliquots will be collected, after debris screening, at the feed bin drop point to the incline conveyor feeding the TTU. Four corresponding treated soil composite samples will be collected from the treated and re-hydrated soils either at the drop point from the pugmill mixer to the stacking conveyor or at the drop point from the stacking conveyor to the treated soil stockpile. The individual treated soil aliquots will be collected at times determined by the soil feed rate. For example, if it takes 15 minutes for soil to transit the TTU from the feed bin drop point to the treated soil stockpile, the corresponding treated soil aliquots will be collected approximately 15 minutes after the feed soil aliquot was collected. The individual aliquots comprising each composite sample will be thoroughly homogenized in a decontaminated stainless steel mixing bowl and the homogenized soils will be placed in appropriate sample jars. Samples for the analysis of VOCs will not be homogenized. Rather, one of the grab aliquots from each composite sample will be selected and soils placed directly in an appropriate sample jar. A total of eight composite samples (four feed soil and four treated soil samples) will be submitted for laboratory analysis for each 200-ton campaign. The proposed test burn sampling program will provide sufficient data to evaluate the content and variability of the feed stock for comparison with the treated soils data. In this way, any unexpected variability in treated soil data can be compared with the corresponding feed stock.

Quality Assurance/Quality Control (QA/QC) samples will be submitted for each treatment campaign as described in Section 10.3.

Upon completion of the test burn phase and determination of the optimal operating conditions, the final 200-ton stockpile, if necessary as described above, will be processed through the TTU at a 100% soil feed rate. Feed soils and treated soils will be sampled as described above.

In addition to the sampling described above, one composite sample will be collected of soils from the cyclones and one composite sample will be collected of soils from the bag house during each 200-ton treatment campaign, including the final treatment campaign conducted under optimal operating conditions. Individual aliquots will be collected at approximately one hour frequencies during each treatment campaign (e.g. at a soil feed rate of 40 tons per hour, five aliquots would be collected). It should be noted that the flow of material from the baghouse transfer conveyer to the pugmill is intermittent and aliquots will be collected only when material is available. A minimum of five aliquots will comprise each composite sample. The samples will be managed as described above. The purpose of this sampling is to confirm effective treatment of particulate phase soils that are processed through the TTU and collected in the particulate collection system. Identification of particulate soils that do not meet treatment goals may warrant additional fine-tuning of the TTU operating conditions. In the unlikely event that inadequate treatment of the particulate phase soils is identified, additional testing may be performed.

Ultimately, the particulate phase soils collected in the cyclones and baghouse are delivered to the pugmill mixer and blended with soils exiting the dryer and sent to the treated soil stockpile. Treatment goals must be achieved in the final stockpile and sampling of the treated soil stockpile will provide adequate testing of the particulate phase soils. Independent testing of the particulate phase soils will not be continued beyond the test burn period.

Each sample collected during the test burn program will be submitted for chemical analysis by the following methods:

Constituents	Analytical Method
CEMs	Method 8330 Modified
VOCs	Method 8260B
TPH-DRO/MO	Method 8015B Modified

Test burn samples will be analyzed on an expedited basis (expected 1 to 3 day turn around time) so that appropriate operating conditions can be established and full-scale operations can commence as soon as possible.

A Test Burn Campaign Form (example provided in Appendix G) will be completed for each 200-ton campaign. This form will document the critical operating conditions being evaluated (e.g. soil exit temperature) and the laboratory samples collected during each campaign. Attachments to this form will include the daily ESMI Operator Log, a copy of the soil exit temperature circle chart, the sample chain-of-custody form and summaries of analytical results once they are available from the laboratories.

Upon completion of the test burn phase, a *Test Burn Report* will be prepared as described in Section 12.1 and submitted to DSHW for review and approval.

The test burn campaign is designed to determine optimal operating conditions for the TTU. It is expected that at least one of the test burn campaigns will yield treated soils that do not meet the treatment goals. Test burn campaign soils that do not meet treatment goals will be segregated and re-processed through the TTU during full-scale treatment operations.

10.1.2 Stack Test Period

Upon completion of the test burns and once test burn phase sampling data are available, ESMI will have established optimal operating conditions for full-scale TTU operations and treatment operations may commence at this time. Once established, the operating conditions will be transmitted to DSHW and DAQ verbally and formally proposed in the *Test Burn Report* to be submitted shortly thereafter. The first two to three days of the full-scale operational period will be used to perform stack testing. Please refer to Section 8.2.1.3 for details regarding the stack testing program. During the stack test period, the TTU will be operated at a 100% soil feed rate and at the operating conditions determined via the test burn campaigns. EBCo may proceed forward with the stack test using the recommended optimal operational conditions, even if the Test Burn Report has not yet been formally approved by DSHW.

A second stockpile containing approximately 2,000 to 2,500 tons of soil will be created for use during stack testing. This soil will be excavated and prepared in a manner similar to that used to create the test burn stockpile. This stockpile, stored in the Treatment CAMU, will contain each of the constituent classes present in site soils. CEMs will be present at above-average concentrations. However, constituent concentrations for other chemical classes (i.e. VOCs, SVOCs, petroleum hydrocarbons) in this stockpile will be lower than the test burn stockpile because the majority of the higher concentration soils will have been consumed during the test burn phase.

During the stack test period, feed soil and treated soil samples will be collected at a frequency of one composite sample per approximately 140 tons of soil. Individual aliquots will be collected at an hourly frequency. Assuming a soil feed rate of between 30 to 40 tons per hour, each composite sample will consist of between four and five aliquots. At this time, it is expected that a maximum of five feed soil and five treated soil composite samples will be collected daily. The feed soil samples will be used to characterize the feed stock for comparison with the stack test results and to quantify daily variability in the feedstock constituents and concentrations. The treated soils may be divided into segregated stockpiles that are each represented by a single sample (approximately 140 tons per stockpile) or managed as larger stockpiles that are represented by more than one sample. At least three stockpiles per day will be generated, consistent with the plans for full-scale operation.

The feed soil and treated soil samples will be collected and managed as described in Section 10.1.1. No separate sampling will be performed of the soils removed from the cyclones or the bag house. Each sample will be analyzed for CEMs, VOCs, SVOCs, TPH-DRO/MO. A Stack Test Sample Collection Form (example provided in Appendix G) will be completed for each composite sample documenting sample identification, date, time range and associated tonnage of each composite sample collected of untreated and treated soils. The number of aliquots comprising each composite sample will also be identified.

The results of the stack test period soil sampling will be submitted to DSHW in a *Stack Test Report*, further described in Section 12.2.

10.1.3 Initial Operational Period

Upon completion of the stack test, thermal treatment operations for site soils will commence at the operating conditions established during the test burn phase. Until formal approval of the final operating conditions are received from DSHW, the treatment system will be operated at an 80% feed rate with all other operating parameters set at values determined by the test burn results. It is expected that DSHW and DAQ will approve the site-specific operating conditions within approximately one week of receiving the *Test Burn Report*. Once the operating conditions are approved by DSHW and DAQ, full-scale operations (100% feed rate) will commence. Alternatively EBCo and ESMI may decide to defer full-scale operations until DSHW and DAQ approve the proposed operating conditions. The initial full-scale operational period is expected to last ten treatment days. An intensive sampling program will be implemented during this initial ten-day operational period.

During the initial operational period, one composite sample of treated soil will be collected for every approximately 140 tons of soil processed through the TTU. Each individual aliquot will be collected at an hourly frequency from either the drop point from the pugmill to the stacking conveyor or from the drop point from the stacking conveyor to the treated soil stockpile. Each composite sample for analysis will be stored in a stainless steel bucket (one bucket for each 140 tons processed). The samples will be homogenized and placed into appropriate sample bottles as described previously. An Initial Full-Scale Operational Period Sample Collection Form (example provided in Appendix G) will be completed for each composite sample documenting the sample identification, date, time range and associated tonnage of each composite sample collected of treated soils. The number of aliquots comprising each composite sample will also be identified.

It is expected that the results of the test burn phase and stack testing period will demonstrate that a reduced analytical testing protocol is appropriate for full-scale operations. Specifically, it is expected that analysis for petroleum hydrocarbons and VOCs will not be necessary. The need to analyze for petroleum hydrocarbons and VOCs will be determined by the results of the test burn phase and stack testing period. At a minimum, composite samples collected during full scale operations will be analyzed for CEMs. Analysis for SVOCs will only be performed when processing soils from SWMUs 17 and 24 containing SVOCs (more specifically, PAHs) above risk-based limits. DSHW will be provided with applicable TTU operating records and analytical data to support the reduced analytical testing protocol. Until DSHW issues written approval of the reduced testing protocol, EBCo will accept verbal approval of the reduced analytical program and will proceed accordingly.

Upon completion of the initial full-scale operation phase, an *Initial Full-Scale Operations Report* will be prepared as described in Section 12.2 and submitted to DSHW.

10.1.4 Full-Scale Operational Period

Upon completion of the initial operational period, EBCo will review and evaluate the treated soil results and present them in the *Initial Full-Scale Operations Report.* EBCo expects that the sampling completed during prior phases will demonstrate a consistent soil quality, meeting the treatment goals. The sampling frequency for the full-scale operation will be one composite sample per eight-hour operational period or three composite samples per day. A segregated soil stockpile will be maintained for each eight-hour period so that each stockpile will be represented by one composite sample. EBCo may request a reduction in this frequency at any time subject to review and approval by DSHW. Regardless of the DSHW-approved sampling frequency, individual aliquots will be collected at an hourly frequency, unless a reduced frequency is subsequently approved by DSHW, and managed as described in previous sections. A Full-Scale Operational Period Sample Collection Form (example provided in Appendix G) will be completed for each composite sample documenting the sample identification, date, time range and associated tonnage of each composite sample collected of treated soils. The number of aliquots comprising each composite sample will also be identified. At a minimum, the composite sample(s) will be analyzed for CEMs. The need to sample for petroleum hydrocarbons and VOCs will be dictated by the results of the test burn phase and stack testing period. Analysis for PAHs in the post-treatment soils will be performed only for those segregated soils from SWMUs 17 and 24 that contained elevated PAHs prior to treatment.

As described in Section 8.4.1, soils containing both lead concentrations in excess of risk-based criteria and elevated concentrations of CEMs will be segregated prior to and after thermal treatment. In addition to the analyses described above, these treated and segregated stockpiles will be analyzed for lead to determine appropriate management of these stockpiles.

Treated soil samples will be analyzed on an expedited basis to confirm that treatment objectives have been met so daily stockpiles can be consolidated. Upon receipt of the laboratory data, a Treated Soil Stockpile Verification Form (example provided in Appendix G) will be completed that documents the treated soils data and final disposition of each daily stockpile. This form will be used to clear treated soils for consolidation in the final treated soils stockpiles or to identify individual stockpiles that have not met treatment goals and require reprocessing through the TTU. Stockpiles containing lead concentrations exceeding risk-based criteria will also be identified.

10.2 Post-Excavation Sampling

Upon completing soil excavation activities at a given location, post-excavation samples will be collected to evaluate the chemical quality of remaining soils. These data will be used by EBCo to make decisions about potential additional excavation and in the RFI for human health and ecological risk assessment. To this end, sample collection, management and laboratory analysis will be conducted in accordance with the RFI Quality Assurance Project Plan (QAPP) (Montgomery Watson, 1998) and amendments thereto so that these data will be fully usable for the RFI.

Excavation Base Samples

One grab sample will be collected per 1,000 square feet of excavation base. Grab samples will be collected from depths of 0 to 0.5 feet using decontaminated stainless steel scoops or bucket augers. A minimum of two base samples will be collected from each excavation (in the cases where the excavation area is small).

Once the excavation limits are established, grab sample locations will be selected using a systematic random sampling approach based on a triangular grid. The grid spacing will be established to meet the criteria of one sample per 1,000 square feet of base. In smaller excavations where two base samples are collected, sample locations will be selected judgmentally or by using a simple random sampling scheme. Sample locations and elevations will be surveyed to a horizontal and vertical precision of ±0.1 foot and staked.

Based on examination of the RFI soils data and knowledge regarding the mechanism of constituent placement (e.g. wastewater management, direct land disposal, etc.), COPC concentrations generally become more evenly distributed at depth and at the lower concentration lateral extremities. As a result, less variability is expected in the completed excavation then may have been observed in surface or shallow subsurface soils sampled during the RFI. Evenly spaced post-excavation soils data collected using a systematic random sampling scheme will be representative of the overall conditions of the completed excavation. Notwithstanding the foregoing, random sample locations may be moved slightly or additional judgmental samples added to ensure data collection in those areas where the greatest impacts would be expected. For instance, post-excavation samples will be collected from directly below the centerline of former wastewater conveyance structures.

Excavation Sidewall Samples

One depth-averaged composite sample will be collected at a frequency of approximately one per 100 linear feet of sidewall. An excavation will be considered to have a sidewall in cases where the sidewall slope is 1:1 vertical to horizontal or steeper and there is at least a two foot elevation difference between the surrounding ground surface and the base of the excavation. Otherwise, the excavation will not be considered to have a sidewall and will be sampled in accordance with the base sampling approach. The total length of the sidewall of each excavation area will be measured and an appropriate spacing interval will be determined to establish a whole number of samples at a distance close to 100 linear feet. For instance, seven samples will be collected at a spacing of approximately 106 linear feet from a sidewall having a total length of 740 linear feet. The initial sample location will be selected randomly. Individual sample aliquots will be collected at approximately one foot intervals starting at a depth of one foot below the ground surface to the total depth of excavation. The individual aliquots will be placed in a decontaminated stainless steel mixing bowl, thoroughly homogenized and placed in appropriate sample jars. Samples for the analysis of VOCs will not be homogenized. Rather, the VOC sample will be taken directly from the grab sample collected from the midpoint of the sidewall. Where a sidewall is determined to be present, a minimum of two sidewall samples will be collected from each excavation. The location, ground surface elevation and base elevation at each sidewall sample will be surveyed with a horizontal and vertical precision of $\pm$0.1 feet and staked.

Judgmental Samples

Judgmental samples of soil in specific base or sidewall locations may be collected based on a review of the available RFI data or field observations. For instance, if elevated VOCs were detected at a specific depth range in an RFI soil boring, confirmation samples may be collected from the sidewall within the depth range of interest. The need for judgmental samples, if any, will be made on a case-by-case basis by Charter Oak.

Applicable Laboratory Analyses

Samples will be submitted for analysis for only those constituents (or suite of constituents) for which applicable risk-based criteria are exceeded within the excavation area. For example, only CEMs exceed applicable risk-based criteria in the wastewater dispersion area of SWMU 1. Therefore, post-excavation samples from this area will be sampled only for CEMs. Decisions regarding applicable laboratory analyses for post-excavation samples will be based on the results of the RFI soils investigation and review of human health risk assessment results.

10.3 Quality Assurance Project Plan

Soil analytical data collected during the interim measures program will be used to demonstrate the attainment of treatment objectives and for incorporation into the RFI. As such, the data will be collected, managed, analyzed and evaluated in accordance with the RFI QAPP (Montgomery Watson, 1998), as amended by prior communications with DSHW. Charter Oak personnel will perform this work in accordance with its standard operating procedures and documentation.

Analytical Laboratories

The following laboratories will be used for the analysis of samples collected during the interim measures program:

- Southwest Research Institute (SwRI) will provide analysis of CEMs using Method 8330-modified. This is the same laboratory and method used during the RFI for the analysis of CEMs.
- Severn Trent Laboratories of Denver, Colorado (STL-Denver) will provide analysis of VOCs, SVOCs, TPH-DRO/MO and metals. This is a modification from the approved QAPP for the RFI. However, DSHW was notified of this change in a June 4, 2003 letter and STL-Denver has been used for the RFI since that time.

The following laboratory methods may be used during the interim measures program either for post-treatment or post-excavation sampling:

Constituents	Analytical Method
CEMs	Method 8330 Modified
SVOCs	Method 8270C
PAHs[1]	Method 8310
VOCs	Method 8260B
TPH-DRO	Method 8015B Modified
Metals	Method 6010B

[1]The analysis of PAHs by Method 8310 will be limited to Benzo(a)pyrene and Dibenz(a,h)anthracene.

In order the meet the rapid turn-around time requirements for the post-treatment samples, two minor modifications from standard laboratory procedures are planned. These modifications are considered acceptable by our data validation specialist (Diane Short and Associates, Inc.). These modifications will not normally be applied to the post-excavation analytical work, for which a rapid turn around time is not needed. However, these methods may be applied to the post-excavation analytical work in instances where rapid turn around is needed to support timely execution of the project and the data will be fully usable in the RFI.

- Thermally treated soils will have a finished moisture content of <11%. Both STL and SwRI have indicated that under these low moisture conditions, the samples can be extracted and analyzed directly without the initial dry weight determination. Portions of the samples will be dried concurrently with the extraction step to calculate the dry weight of soil for the final determination of dry weight concentration.
- SwRI has recommended performing a vortex extraction procedure instead of the 18-hour sonication extraction as defined in Method 8330. The vortex extraction is based on a
- U.S. Army Toxic and Hazardous Materials Agency method. SwRI has successfully used the vortex extraction procedure for the analysis of CEMs on other projects. To confirm the vortex extraction method, SwRI will perform a spike recovery study (high, medium and low levels in triplicate), a method detection limit (MDL) study (10 spikes at 3-5 times the signal/noise ratio) and an initial proficiency recovery study (IPR) as outlined by EPA Method 8000 (four samples). Site soils will be used for the spike recovery study. Per EPA methodology, certified clean soils will be used for the MDL and IPR studies.

This study will be run side-by-side with the standard modified method for comparison. The results of this study will be provided to DSHW for their review.

Quality Assurance/Quality Control (QA/QC) Samples

For the test burn phase QA/QC samples will be submitted at a frequency of one QA/QC set per test campaign for each analytical method. This frequency is consistent with the QAPP and represents one QA/QC set per a maximum of twenty samples. Each QA/QC set will include one field replicate, one matrix spike sample (MS), one matrix spike duplicate sample (MSD) and one VOC trip blank. No equipment blanks will be collected. The QA/QC samples will be collected from the treated soils.

For the stack test and initial operational periods (approximately 10 days), QA/QC samples will be submitted at a frequency of approximately one QA/QC set per day for each analytical method. This frequency is consistent with the QAPP and represents one QA/QC set per a maximum of twenty samples. Each QA/QC set will include one field replicate, one matrix spike sample (MS) and one matrix spike duplicate sample (MSD). The QA/QC samples will be collected from the treated soils. A VOC trip blank will only be submitted if it is determined that VOCs require analysis during the initial full-scale operational period.

During the remainder of the full-scale operational period, QA/QC samples will be submitted at a frequency of one QA/QC set per 20 samples submitted for each analytical method. QA/QC samples will not be submitted with each daily batch of treated soil samples. The scheduled frequency of one QA/QC set per 20 samples is consistent with the QAPP. Each QA/QC set will include one field replicate, one matrix spike sample (MS) and one matrix spike duplicate sample (MSD). No equipment blanks will be collected or analyzed for these samples. A VOC trip blank will only be included if samples are submitted for analysis by Method 8260B.

For the post-excavation samples, QA/QC samples will be submitted at a frequency of one QA/QC set per 20 samples for each analytical method. One QA/QC set will be submitted per sample batch if the batch size is smaller than 20 samples. Each QA/QC set will include one field replicate, one MS/MSD pair, one equipment blank if non-dedicated sampling equipment is used, and one trip blank when VOC samples are collected.

Data Validation

Diane Short and Associates, Inc. (DSA) provides data validation services for the RFI as a subcontractor to Charter Oak. DSA will also perform data validation for the interim measures program.

As described in Section 8.4.2, it will not be possible to complete data validation prior to clearing treated soil stockpiles for placement in the final treated soil stockpile(s). Upon receipt, the data packages will be given a gross review to determine if significant data quality issues are present; however, the decision to approve a treated soil stockpile for storage will be made based on the pre-validated data. Based on Charter Oak's experience with the analytical laboratories that will be used for this project and the data collected throughout the RFI, it is a very rare occurrence to have data rejected through data validation. It is more likely that some data will be qualified has having a high or low bias due to matrix effects or some reported low detections will be qualified at "non-detected" based on the presence of target constituents in method or laboratory blanks. Final risk assessment of both the treated soils data and post-excavation soils data will be conducted on validated data.

10.4 Data Quality Objectives

Post-excavation and treated soil samples will be definitive data, meaning that the data will be collected using standard sampling methodology and analytical methodology of known precision and accuracy. As such these data, once validated, will be of suitable quality for risk assessment and site characterization purposes. The data quality objectives for post-excavation and post-treatment sampling and analysis are as follows:

- The collection of data of suitable quantity and quality for human health risk assessment conducted in accordance with UAC R315-101-5.2. Potential receptors evaluated in the HHRA include the on-site industrial worker, the on-site construction worker, the visitor/trespasser, the off-site resident and possibly the hypothetical future on-site resident. HHRA methodology and receptors are described in the *Proposed Human Health Risk Assessment Methods RCRA Closure of Open Burning Open Detonation Units* (Charter Oak, 2004b) as modified in response to DSHW comments.

- The collection of data of suitable quantity and quality for ecological risk assessment purposes. Ecological risk assessment methodology is described in the *Revised Tier I Screening Level Ecological Risk Assessment Report* (Charter Oak, March 2004a) and the *Spatial Ecological Risk Assessment Work Plan* (Charter Oak, 2004c).

- Collect sufficient post-excavation analytical data to be representative of in-place soils remaining after soil excavation. These data will be of suitable quantity and quality for human and ecological risk assessment purposes as described above.

- Collect sufficient treated soils analytical data of suitable quantity and quality to demonstrate that treated soils are appropriate for permanent placement at the EBCo site.

11.0 SCHEDULE

It is EBCo's desire to conduct the proposed interim measures as soon as feasible. In general, these activities are planned to begin in late 2005 with completion in 2006. The precise starting date for physical activities on the site will depend on when the necessary approvals or permits are in place and may depend on weather conditions. The following is a general description of the overall schedule of activities.

In order to authorize the thermal treatment contractor to mobilize equipment to the Spanish Fork site, the air permit, the corrective action order authorizing the use of the treatment CAMU and the work plan approval need to be in place. From authorization to mobilize the following general timeframe applies.

Weeks 1 - 2: Mobilize equipment to the site.

Weeks 2 - 6: Set up thermal treatment equipment on-site and conduct operational shakedown.

Weeks 6 – 8: Perform treatment trials to optimize operating temperature of thermal treatment equipment.

Weeks 4 – 8: Begin excavation and soils management activities.

Week 8 +: Conduct full-scale thermal treatment operations. While the total duration of this activity will depend on the total quantity of soils treated, it is estimated that this activity will continue for about 16 weeks (shorter if less soil is treated and longer if more soils are treated)

From the time of authorizing mobilization to completion of active thermal treatment activities will be approximately six months. Demobilization will be performed following thermal treatment activities and the length of time will vary depending on post-treatment maintenance needs and the destination of the equipment following this project.

Overall, the rate of treatment is expected to be a minimum of 15,000 tons per month during the active treatment period. Thermal treatment operations will be performed six days per week, 24 hours per day, with all or a portion of the seventh day each week devoted to scheduled maintenance.

12.0 REPORTING

The following sections describe interim measure-related reports that will be prepared and submitted to the DEQ. As described in Section 8.6.2, informal daily reports will also be provided to DSHW during at least the first four weeks of full-scale operation.

12.1 Test Burn Report

Upon completion of test burn phase and receipt of analytical data, an "*Interim Measure Test Burn Report*" will be submitted to DSHW and DAQ. This report will contain the following information and data for each treatment campaign:

- A narrative accounting and description of the test burn period and each individual treatment campaign including the Test Burn Campaign Form (Attachment A)
- AWFSO Verification Report/Form
- Continuous emissions monitoring data (carbon monoxide and oxygen) in both tabular and graphical format
- Soil exit temperature, feed rate and other pertinent operating records from the thermal treatment unit for each treatment campaign in both tabular and graphical format
- Daily Operating Logs prepared by ESMI
- The quantity of soils treated during each treatment campaign
- The quantity of debris (60mm+) material screened out during soil preparation and observations of debris conditions based on visual inspection
- Summary tables of feed soil and treated soils data
- Laboratory reports for feed soil and treated soils data (in PDF format)
- Justification for limited constituent list for full-scale operations (i.e. removal of VOCs and petroleum hydrocarbons from the analytical program)
- Recommendations for optimal full-scale operating conditions

It is unlikely that the analytical data will be validated prior to submission of the *Test Burn Report*. A data validation report and final validated data will be presented in the Interim Measures Report.

12.2 Stack Test Report

Upon completion of stack testing and receipt of analytical data, a "*Stack Test Report*" will be submitted to DSHW. This report will contain the following information and data for each treatment campaign:

- A narrative accounting and description of the stack test period
- Stack testing report prepared by stack test contractor
- Laboratory reports for stack test data
- Continuous emissions monitoring data (carbon monoxide and oxygen) in both tabular and graphical format
- Soil exit temperature, feed rate and other pertinent operating records from the thermal treatment unit in both tabular and graphical format
- Daily Operating Logs prepared by ESMI
- The quantity of soils treated during the stack test period
- The quantity of debris (60mm+) material screened out during soil preparation and observations of debris conditions based on visual inspection
- Summary tables of feed soil and treated soil data
- Laboratory reports for feed soil and treated soils data (in PDF format)
- Justification for limited constituent list for full-scale operations (i.e. removal of VOCs and petroleum hydrocarbons from the analytical program)

It is unlikely that the analytical data will be validated prior to submission of the *Stack Test Report*. A data validation report and final validated data will be presented in the Interim Measures Report.

12.3 Initial Full-Scale Operations Report

Upon completion of initial full-scale operational period and receipt of analytical data, an "*Initial Full-Scale Operations Report*" will be submitted to DSHW. This report will contain the following information and data for the initial full-scale operational period:

- A narrative accounting and description of initial full-scale operational period
- Continuous emissions monitoring data (carbon monoxide and oxygen) in both tabular and graphical format
- Soil exit temperature, feed rate and other pertinent operating records from the thermal treatment unit in both tabular and graphical format
- Daily Operating Logs prepared by ESMI
- The quantity of soils treated
- The quantity of debris (60mm+) material screened out during soil preparation and observations of debris conditions based on visual inspection
- Summary tables of treated soils data
- Laboratory reports for treated soils data (in PDF format)
- Justification for the collection of one sample for each eight hours of operation with supporting data

It is unlikely that the analytical data will be validated prior to submission of the *Initial Full-Scale Operations Report*. A data validation report and final validated data will be presented in the Interim Measures Report

12.4 Interim Measures Report

The completed interim measures program will be documented in the "*Interim Measures Report*". This report will be submitted to DSHW within 120 days of the completion of interim measures. The report will contain the following information and data:

- A narrative accounting and description of the interim measures activities completed
- Description of the thermal treatment system startup and performance demonstration with reference to previously issued reports
- Continuous emissions monitoring data (carbon monoxide and oxygen) in both tabular and graphical format
- Soil exit temperature, feed rate and other pertinent operating records from the thermal treatment unit in both tabular and graphical format
- Daily Operating Logs prepared by ESMI
- The quantity of soils treated
- The quantity and reasons for any stockpiles that required re-treatment
- The quantity of soils delivered to off-site disposal facilities
- The quantity and final disposition of debris (60mm+) material screened out during soil preparation and observations of debris conditions based on visual inspection
- Description of the quantity, location and status of treated soils
- Manifests and/or bills of lading for off-site shipment of materials
- Disposal tickets from off-site landfills
- Maps illustrating the interim measure excavations
- Summary tables of validated feed soil and treated soils data
- Complete laboratory reports for feed soil and treated soils data, unless previously submitted (in PDF format)
- Data validation reports for feed soil and treated soils data
- Description of any special management issues encountered during the interim measure
- Description of storm water management, if any
- Deviations from the Interim Measures Work Plan

12.5 Information Useful in the RFI

The post-excavation sample data will not be presented in the Interim Measures Report. These data will be incorporated into the RFI Report and will represent a new baseline for soils data where interim measures activities occurred. RFI soils data representative of soils that were excavated during the interim measures program will be removed from the final human health and ecological risk assessments conducted as part of the RFI.

Upon receipt and validation of final post-excavation data, EBCo will provide DSHW with summary tables of post-excavation data and maps which illustrate the post-excavation sample locations. This will be a separate submittal from the Interim Measures Report. Complete reporting of the post-excavation laboratory analytical reports and data validation documentation will be provided in the RFI Report.

13.0 REFERENCES

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Charter Oak Environmental Services, Inc. (2004c), Spatial Ecological Risk Assessment Work Plan, The Ensign-Bickford Company, Spanish Fork, Utah

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APPENIDIX A

TREATMENT GOALS
FOR SOIL INTERIM MEASURES
FORWARD RISK ASSESSMENT RESULTS

APPENDIX B

LOW TEMPERATURE THERMAL TREATMENT OF EXPLOSIVES CONTAMINATED SOILS AT THE KANSAS ARMY AMMUNUTION PLANT, PARSONS, KANSAS

APPENDIX C

ASTEC TTU SYSTEM INTERLOCKS

APPENDIX D

REPRESENTATIVE PHOTOGRAPHS OF THERMOCOUPLES USED TO MEASURE TREATED SOIL AND OXIDIZER TEMPERATURES

APPENDIX E

ESMI DAILY OPERATING LOG

APPENDIX F

TEST BURN STOCKPILE
REPRESENTATIVE SOILS DATA AND APPROXIMATE SOIL VOLUMES FROM EACH LOCATION

APPENDIX G

EXAMPLES OF
TEST BURN CAMPAIGN FORM
STACK TEST SAMPLE COLLECTION FORM
INTIAL FULL-SCALE OPERATIONAL PERIOD SAMPLE COLLECTION FORM
FULL-SCALE OPERATIONAL PERIOD SAMPLE COLLECTION FORM
TREATED SOIL STOCKPILE VERIFICATION FORM